

CULTIVATION OF *Vitis vinifera* L. IN THE LIGHT OF FORMER PUBLICATIONS AND TODAY IN POLAND

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Abstract

In the countries of the Mediterranean Basin viticulture has been dealt with for centuries. It was known to the ancient civilizations of the Middle East and grapevines were widely planted in Greece and Rome. The vineyard was part of the utility garden, usually occupying large areas and at the same time being a connection with the landscape. Creeper vine was also used in decorative gardens as an ornamental plant for various types of buildings and garden structures. The Polish tradition of planting vineyards dates back to the Middle Ages and is mainly associated with the activities of monks, although it was not as common as in the countries of southern Europe. However, in Polish gardening literature and in the literature that describes the development of the art of gardening, you can find lots of tips on how to grow grapevines, their varieties and the descriptions of the vineyards.

Key words: *Vitis vinifera* L., vineyards, historic utility garden, current cultivation

INTRODUCTION

Vitis vinifera L., *Vitaceae* family, includes about 60 species. The territorial range of grapevines extends from southern Europe (Mediterranean Basin) through the area around the Caspian Sea to the Himalayas [1]. Botanists locate the first planting of grapevine in the mountainous regions of Armenia [2]. A lot of evidence of grapevine, or *Vitis sylvestris* Gmel. recognized as its ancestor, can be found in the Middle East [3]. These are, for example, some seeds stored in earthen clay vessels dating back to the end of the seventh millennium BC. In Egypt frescoes, wall paintings in the tombs presenting vines stretched on structures, activities related to the care of grapevines or stamps with the image of a grapevine from the First Dynasty (c. 2960-2770 BC) confirm vine growing in this region.

Historical records and garden treaties show that the first grapevine gardens were of a purely utility character. In addition to olive groves and fruit orchards, perennial plants of vines occupied large areas. The method of their cultivation has changed over the centuries. To a large extent, it depended on the location and climate. Climbing vines were spread on some structures or poles. They could be planted in the vicinity of fruit trees on which they climbed. On rocky slopes, in poor areas, vine shoots were spread out directly on the ground or on piled stones in the form of a cone or on stone terraces [1].

In Israel, stone props were widely used. Spread shoots easier absorbed the moisture coming from dew and the fruit ripened better on heated stones [4]. *Vitis* is a long, strong climber, with sympodial annual growth of about 1–2 meters. The bark of lignifying shoots is usually longitudinally fibrous, scaly and flaking [5]. 5-petal flowers, small, separated or bisexual, are gathered in panicles of 20 cm length. The fruit of the grapevine are spherical berries with 2 to 4 seeds, gathered in clusters. *Vitis* climbers become ornamental in fruiting time, in late summer until winter, and in autumn, mainly thanks to their lobed leaves which in some species very decoratively turn the color to golden yellow or reddish-purple [6].

In Poland, with the climate by far cooler in comparison to the regions of southern Europe, viticulture was more difficult. Some wine making experts were often invited to Polish manor houses and by setting up a vineyard they increased the rank of a manor and its garden as well as the level of local winemaking. The Tyniec abbey, thanks to its constant contacts and exchanges with Benedictine congregations in western Europe, has been for centuries one of the most important centres of viticulture in southern Poland [7].

The aim of the study was to analyze selected written sources connected with vine growing in Europe and its place in shaping gardens. In the face of the residual state of preservation of ancient vine orchards next to royal residences, aristocratic manor houses or monasteries, search in the literature and iconography regarding the tradition of growing grapevines and use of this species in ornamental gardens is an important method for studying the art of gardening. The idea of this paper is to draw attention to the use of *Vitis vinifera* L. in the creation of both utility and decorative gardens over the centuries.

MATERIALS AND METHODS

The study procedure was carried out using literature which has been created from the nineteenth to the twenty-first century. Foreign travels or published manuals containing instructions for vine growing and for wine production were the basic source of knowledge of horticulture and development of gardens for former landowners. The most important books that were used to write the article include the following: “*The vine, its planting in the ground and in the buildings*” from 1877 and “*Orchard and Utility Garden*” (1893) by Edmund Stanislaw Jankowski, the publication of Stanisław Strumiłło “*The Gardens of the North*” (1820) and J.G. Bornemann “*Vine growing around buildings, walls, cold stores and trees*” (1842). Descriptions of

vine growing in modern times come from sources such as monographs and scientific articles.

RESULTS

Vitis vinifera L. is one of the oldest plants, together with cereals [8], and vineyards are significant spatial elements used in gardens [9]. Information about the cultivation of vine can be found in the Bible, in the Book of Genesis (9:29): “Noah being a farmer was the first to start a garden.” The alleged place of the vineyard was the area around Mount Ararat (Armenian Upland), although some researchers define Palestine as a “vine garden of the world” [10].

The descriptions and images of gardens in Egypt, Greece and the Roman Empire indicate the prevalence of growing this species. In Egypt vines were planted in the region of the Nile River delta and in the oases, in which a water tank was an important part [1]. Most frequently, vine shoots were spread on arched supports or trellises forming long lines and systems (Fig. 1) [11]. This method of spreading plants allowed for collection of fruit, while at the same time creating a “shelter from the sun”, a refreshing place, or the zone of small flowerbeds. Greece and Rome were famous for their highly developed culture of vine growing. Mountainous areas with good exposure to the sun were ideal locations of utility gardens – olive and vine orchards.

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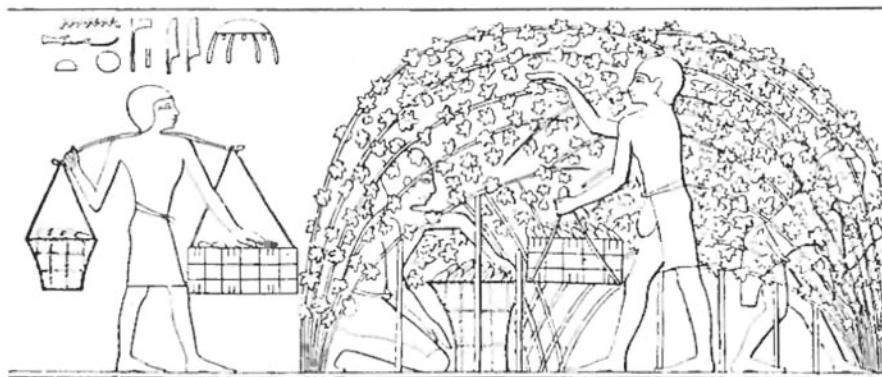


Fig. 1. Picking up fruit from a vine pergola with a round design (Gotheim 1914)

The product of the vine – wine, became the most important component of the Greek and Roman material culture, and the areas of vine cultivation quickly spread to south-western Europe. Over the next era, the vine, its new strains and varieties were grown “for table use”, both for the laity and for clergy “connoisseurs”. Wine was a popular drink served with meals, it satisfied the liturgical needs of monks and was also considered a kind of medicine [12,13]. In ancient times and in later epochs, it became an important commercial product [14]. Not only royal families, but also monks and townspeople were owners and users of gardens.

In the Middle Ages vine cultivation was propagated mainly by the church [15]. Grapevine, grapes and wine were a symbol of blessing and abundance, time of peace and unity of the church. They also symbolized the blood of Christ, youth, the Holy Spirit, and eternal life. The vineyard was compared to Israel and the chosen people [16]. Vine orchards were set up by monasteries and their keepers were monk-gardeners – *gardinarius* or *hortulanu* – as well as specialists, *vitis capicerius* [17,18].

Vines were perennial crops occupying large areas next to monasteries as well as royal and princely

residences. They constituted a significant dominant of landscape, both because of the vast area which they occupied, mostly on the southern, sun-lit slope, as well as because of their composition [19–22]. The preserved iconography shows utility gardens of the Middle Ages generally closed. Fencing, depending on the latitude, consisted of battens of wood, stone walls or embankments and thorny branches. Vineyards were equipped with towering structures – watchtowers, with the living quarters for the owners or hired guards for the time of work in the vineyard (Fig. 2). There were also rooms for wine. Vineyards were guarded against farmed and wild animals (wild boars, foxes) and against theft [23].

The iconography included in the book “*Georgica curiosa*” of 1695 by Wolf von Hohberg Helmhardt shows large areas of crops located in a hilly terrain, which are protected by guards – people in pulpits and bird-scaring knockers (Fig. 2, Fig. 3). According to Czepiński (1874), vineyards were located in “protected places” [14]. Sometimes rows of trees and shrubs, such as poplars and hazel as their undergrowth, served as a protection from the wind [24]. A typical example were terraces built of dry stone walls [25,26]. This form protected the slope against erosion, accumulated solar energy and protected from the wind [27]. Grapevines were also planted separately in rows.



Fig. 2. View of a fenced vineyard and a farm (W.H. von Hohberg 1695)

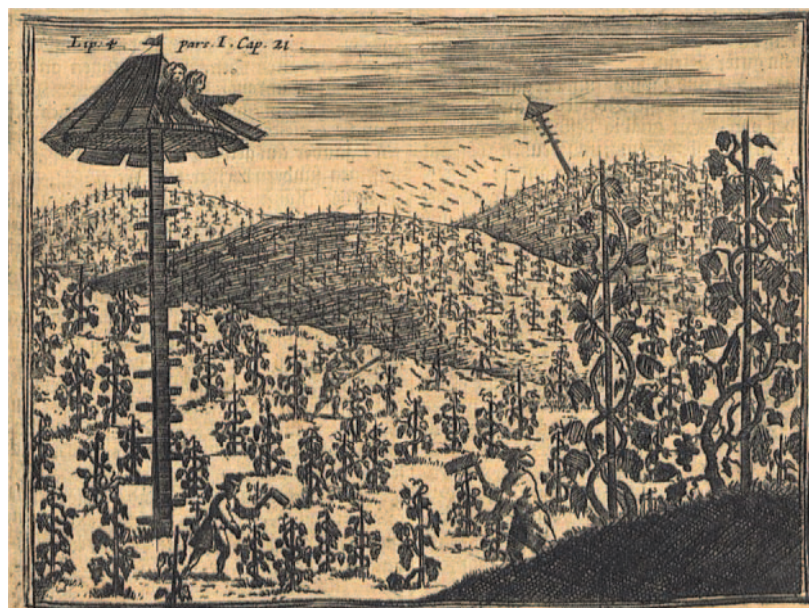


Fig. 3. Guards on the towers and bird-scaring knockers in a vineyard (W. H. von Hohberg 1695)

In addition to large area vineyards, there were also built small ones, combining the cultivation of this species with utilitarian or decorative use. Often, plants such as limes, poplars and tamarisks served as a support for climbing plants. In antiquity this kind of cultivation was described as “married vine” [10]. At a convent, usually in a *hortus conclusus*, vines were planted with medicinal plants and aromatic and ornamental species – roses, lavender and gillyflower [9,20]. Vineyards of the bourgeois were located next to walls, buildings and fences [19], training vines on trellises using the so-called Kolbe’s method (fan-shaped) or Thoméry’s method (candelabra-shaped) [14].

In garden designs during the Renaissance and Baroque, vine orchards were located near fruit and vegetable gardens, as part of the comprehensive programme of contemporary gardens [28]. During this time, vine plants also become an important element in the interiors of ornamental gardens. An engraving from 1583, included in the publication by Riat “*Art des Jardins*” (1870), reflects a Dutch garden of de Vries, with geometric division into quarters, closed with wooden trellis, shady sidewalks and accented with gazebos in the corners. They are overgrown with vines whose large leaves, as is clear from the description, shade the covered passages and the fruit can be picked by people walking around. Trellis and bersos overgrown by vines are placed above the garden alleys. In the landscape, the vineyard is isolated from ornamental parts.

However, the aesthetic qualities of the vine were also used for making original garden accents such as “*tuteurs*” – green garden gazebos made of several vines planted around a large tree, at a distance from the trunk. Vines overgrew a variety of garden structures protecting their users from rain and sun, at the same time being a meeting place [29].

Polish examples of grapevine orchards in the past

The first traces of wild vines in Poland come from fossil materials from the Tertiary period [19]. Vine seeds were found by Professor Władysław Szafer in a salt mine in Wieliczka, which proves that in the Miocene the vine grew wild in Poland [30]. The first mention of bringing vines to Western Pomerania is attributed to Bishop Otto of Bamberg (early twelfth century) [9]. In this period, vineyards were founded by the Cistercians in Gościkowo, Obra and Gubin [19]. Small vineyards in the monasteries in Warsaw, Krakow and Lublin are mentioned in the “*The outline of Polish gardening*” by Edmund Jankowski (1923) [31].

Polish rulers as well as wealthier nobility and townspeople set up numerous vine orchards next to the castles and manors, as having them was considered to be prestigious and it enhanced the value of the prop-

erty. Besides, people were encouraged to grow vine for pleasure, as a drink, and to a lesser extent for a living [32].

Szymon Starowolski wrote the following words about the popularity of wine in Poland: “In the times of the Polish king Zygmunt August, wine was prepared only in one house in Cracow, but now you can find it almost in each house, in monasteries, in vicarages and in manors” [33]. The description of the garden at the castle in Lipowiec (1643) can be an example of the location and method of arrangement of cultivation areas: “A large vineyard on the hill, at the castle, fenced with brush and blackthorn. A vegetable garden, with old vine, apple trees and plum trees....” [34].

Edmund Jankowski, in “*The vine, its planting in the ground and in the buildings*” of 1877, defined the conditions for the cultivation of vines and showed the methods for their reproduction [29]. He recommended limestone soil, rich in humus. He also recommended fertilizing the soil with compost. The author described in detail four ways of propagating grapevines: sowing, grafting, layering, and plant seedlings. For generative reproduction, he recommended plump fruit from which the seeds should be collected. He claimed that young seedlings should be repeatedly dibbled, then placed in a warm hotbed. In the spring, they should be transplanted to the ground, and after 3 years the vines will fruit.

The author claimed that only a part of the plants will have tasty fruit, but according to him this method of reproduction allowed new varieties to be obtained. Jankowski found grafting to be a complicated method and he did not recommend its use, although sometimes people tried to use it to change old, unpalatable vines into “more valuable”. Layering was performed in the spring using shoots of strong specimens. They were bent over to the ground or to baskets filled with the ground, which allowed the vines to be planted in the desired location without damaging the root.

Planting seedlings was regarded as the simplest way of cultivation on a large scale. A seedling consisted of a shoot with several eyelets and it was all woody. The Greeks claimed that thicker stems would root faster [4] than less woody ones. These had to take roots in a very warm hotbed with an air temperature of up to 30°C.

A young vine plant was spread on wires or battens. Due to the problems with the availability of iron, structures for vines were built of wooden battens connected to a cross in the form of a fan trellis. The battens in the trellises were fixed at an angle of 90° or 45° (Fig. 4). However, many authors indicated that in the harsh Polish climate the best way to spread the vine was on a sloping rope (Fig. 5). Such vines could be easily bent to the ground [29].

On large plantations, growing vines in rows was practiced, which facilitated the care of plants – ploughing and fertilization. It also provided a more convenient collection of fruit and sufficient airing of plants. Vines were mostly supported with poles and the rows were positioned to the north – south direction to make the vines evenly sunned [35].

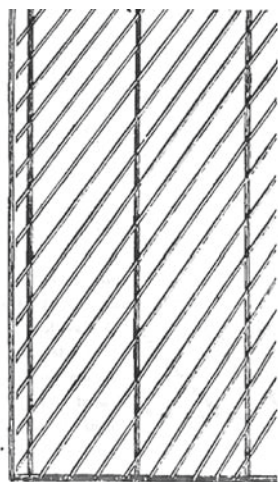


Fig. 4. Fan trellis for growing vines with battens angled at 45° (Jankowski 1877)



Fig. 5. Forming a vine on a sloping rope (Jankowski 1877)

the beginning of November, in order to protect from frost, vines were carefully bent and placed in a hole dug at a depth of about 35 cm. The next year, in mid-March, shrubs were dug up and in April sprigs were spread on wires. Jankowski mentions the winemaker Charles Scholtze's method who, for the winter period, built a structure of staves, obtained from old barrels, over bent vines. The structure was supported with battens with a length of 5 m and he covered it with straw which he again covered with battens. The holes under the roof so formed were left uncovered "... so that cats could come in to hunt for mice".

In Poland in spring vines could be destroyed by cold rains and therefore light wooden frames with stretched canvas were set up over the rows of vines (Fig. 7). In summer work in the vineyard involved nipping off the vines and trimming top clusters of vines to get ripe berries. The following vine varieties were recommended: 'Triumf Polski', 'Diament', 'Chrupka Diuhamela', 'Lipskie Wczesne', 'Madera', 'Magdalena Andegaweńska', 'Magdalena Wiberta', 'Malingier', 'Muszkatel Czarny', 'Muszkatel Somiurski', 'Różane', 'Szasla Czerwone', 'Szasla Fioletowe', 'Szasla Muszkatowe', 'Saszla Piertuszkowe', and 'Szasla Złote' [37].

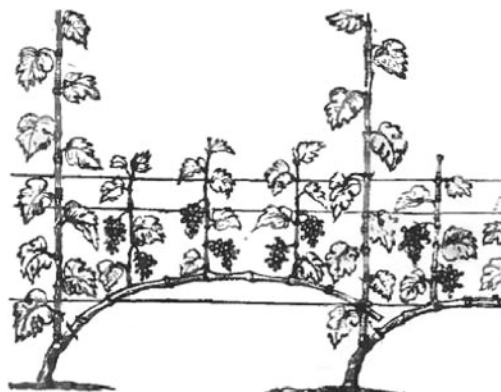


Fig. 6. Forming a vine on a horizontal rope (Jankowski 1893)

In the book "*Orchard and utility garden*" (1893), Jankowski draws attention to the climatic conditions in Poland. The choice of the place and method of planting shrubs is important for the cultivation of vines [36]. He recommended planting on a horizontal rope that was stretched along oak dowels or iron bars spaced every 6 m. Dowels should have a height of 1 m and the rope had to be placed at a height of 35 and 45 cm above the ground (Fig. 6). In spring vines were planted along ropes cut every 1 m above two eyeholes. Young shoots had to be attached to the ropes by willows. Sometimes vines were on both sides of the rope, which was called the two-armed form of training vines.

The author recommended shading the vineyard with a wall with a height of 1 m, which should be painted white to enhance the reflection of light and heat. At

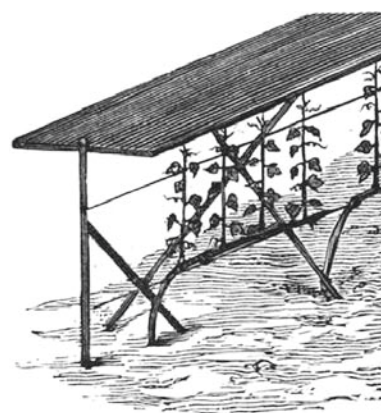


Fig. 7. A canopy over vines to protect them from rain (Jankowski 1893)

Jankowski (1877) also mentioned the possibility of growing vines in a building. He presented some structures, in Europe called an orchard house or *serre-verger* [34]. They were designed for the cultivation of vines as well as peach and fig trees. In Polish conditions, vines were grown in greenhouses-outhouses which were situated at the southern wall of the house (Fig. 8). There, the plants were planted on raised beds to let the light reach all shrubs, because plants “covered by windows” had tasty fruit. These were special buildings similar to a conservatory, but used for vine growing, or the so-called “Dutch *trejbhauzy*” similar to hotbeds.

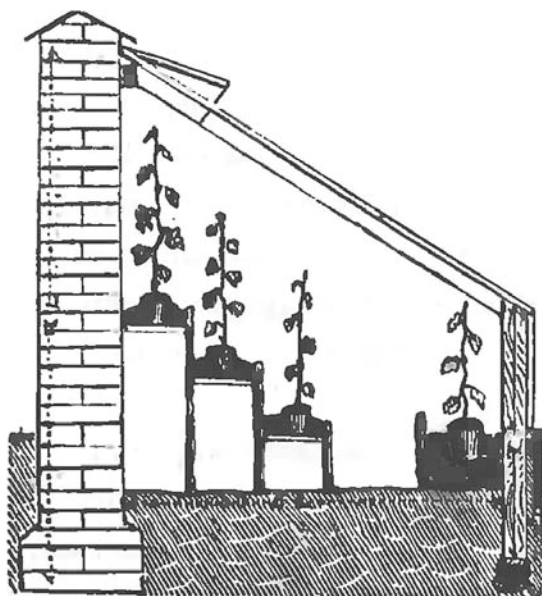


Fig. 8. Cross-section through a backyard greenhouse for vine growing (Jankowski 1877)

Bornemann (1842) pointed that an ideal space for vine growing is the eastern or southern wall of a building [32]. Walls and fences were also a good location; as he claimed, heated during the day, they will give out the heat at night and at the same time they will protect the plant from northern winds [37,38]. The author also suggested planting a few shrubs around branchy trees which, “wrapped” with vines, created a form of green gazebo.

Viticulture today in Poland

Nowadays, the form of training vines depends on the habitat conditions occurring in the vineyard and biological characteristics of different varieties [39]. In the literature it is suggested that the following are the most useful under Polish conditions: the bushy form without a trunk, one or two-armed Guyot, solid single-armed rope (Casenave form) or the sloping rope [12,13,39,40]. However, the form of single-armed

Guyot is considered to be the most useful and easiest to spread [12,13,40].

Currently, the vine in Poland is not a species of great economic importance. However, on 20 December 2005 the Council of the European Union included Poland, together with Belgium, Denmark, the Netherlands, Ireland, Great Britain, the northern Czech Republic, and Germany, with the exception of Baden, in the coolest vine growing zone A. It allowed wine produced in Poland to be sold in the EU market [41–43] and a fast growing interest in the cultivation of this species is observed [44].

In 2008 the vineyard area in Poland was 250–300 ha. In 2011 it was 400–500 ha and currently it is estimated to be approximately 1,500 ha [43,45]. The increased interest in the cultivation of vine, among other things, is the result of the changes in lifestyle of Poles, as manifested by the increase in wine consumption, an interest in enotourism, and the activities of various organizations supporting vine growing [7,46]. Organizations promoting vines are the following, among others: Polish Grapevine and Wine Institute, The Association of Subcarpathian Winemakers, The Association of the San River Valley Vineyards, The Lesser Poland Association of Vistula River Gorge Winemakers, Zielona Góra Winemaking Association, Lesser Poland Association of Vine Forum, The Association of Winemakers in Sandomierz, The Association of Winemakers and Polish Beekeepers, and The Association of Winemakers of Tarnów Region [7,43,44,47,48]. Some regional projects contribute to the popularization of vine cultivation. A good example is the “Vineyards of Lesser Poland” project, which aim was to build backyard vineyards offering regional products [7,44] or to create wine routes such as: Lubusz Voivodeship of Wine and Honey, Subcarpathian Vineyards or Lesser Poland Route of Wine [49].

As Poland was assigned to zone A, its area was divided, taking into account the climatic conditions, in three vine growing regions. Region I includes the following voivodeships: Lubusz, Lower Silesian, Opole, Silesian, the southern part of Greater Poland, and the southern part of Łódź. These are areas with winters of minimum temperatures below -20°C . Region II consists of Lesser Poland, Subcarpathian and Świętokrzyskie voivodeships as well as the southern parts of Masovian and Lublin voivodeships. These are areas of severe winters during which the minimum temperature falls below -20°C or -25°C . In contrast, Region III includes the rest of Poland where viticulture is to have a purely amateur character and at a larger scale it is possible only in the warmest locations [43].

Another division, which was to distinguish geographic wine-making regions in Poland with names that could serve to designate the origin of quality wines

and table wines, was made at the Third Convention of Polish Winemakers [47]. Based on natural conditions, winemaking traditions and administrative boundaries, six regions were isolated in Poland: Zielona Góra Region, Central and Northern Poland, Lower Silesian, Region of Lesser Poland Vistula River Gorge together with Lublin Voivodeship, Lesser Poland Region with Silesian, and Świętokrzyskie voivodeship and Subcarpathian region.

In the literature there is a unanimous opinion that success in the cultivation of vine depends on the choice of the site, the choice of varieties, and the knowledge and experience of the grower [39,45,47]. The choice of the site and variety minimizes the risk of frost damage of plants during winter. For this reason, the most suitable sites are considered to be hillsides located several metres above the valley bottom with the free outflow of cold air and the south-western exposure [13].

In contrast, it is proposed to select varieties from the group of hybrid cultivars created by crossing *Vitis vinifera* species with *V. riparia*, *V. rupestris*, *V. lincecumii*, *V. V. labrusca* or *V. amurensis*. Hybrid varieties obtained in this way have a higher resistance to fungal diseases, partial resistance to *Phylloxera vastatrix* and resistance to low temperatures. Kapłań [46] lists a number of varieties suitable for cultivation in Polish conditions, coming from different groups of hybrids. These include the following cultivars: 'Aurora', 'Baco Noir', 'Marechal Foch', 'Seyval' and 'Verdelet', 'Buffalo', 'Reliance', 'Canadice', 'Einset', 'Price' i 'Festivee', 'Ananasnyj Rannyj', 'Zilga', 'Aloszeńkin', 'Supaga' 'Arkadia', 'Kodrianka', 'Refren', 'Bianca', 'Nero', 'Medina' or 'Palatina'.

At the same time, there are conflicting opinions about the low usefulness of these varieties due to worse quality parameters of wine obtained from them compared to wine obtained from varieties derived from *V. vinifera* [44,50]. Therefore, it is suggested that there should be set up a greater number of vineyards growing varieties derived from *V. vinifera* whose varietal characteristics guarantee success of vine growing in Polish conditions. Typically, the owners of vineyards plant the following varieties from this group: 'Traminer', 'Riesling', 'Seyval Blanc', 'Solaris', 'Hibernal' and 'Johanniter', which are grown for white wine, and 'Regent', 'Rondo', 'Cabernet Cantor' and 'Cabernet Cortis' grown for red wine.

SUMMARY

The conducted literature study, including selected publications on vine growing and its application, is an important step in determining the historical course of action aimed to restore the former garden structure.

The interpretation of source materials allows us to reconstruct or recompose a garden or its part, which is a utility garden, in this case the vineyard. These valuable materials in the form of horticultural treaties and iconography are very useful for any design studies of historical vine orchards and allow the compatibility of crop species to be maintained, which is important in regeneration. In addition, the guidelines are valuable in restoring old winemaking traditions of a given region and rebuilding the culture of our ancestors.

CONCLUSIONS

1. Shrubs of *Vitis vinifera* L. have been used for centuries as the basic plants in vineyards, but also as decorative vines being a part of the composition of an ornamental garden.
2. Historic vine orchards played a big role in the history of Polish winemaking and they require specific specialist research in which descriptive and iconographic sources play an important role.
3. Available studies, including those by Edmund Jankowski, Józef Strumiłło and Johann Borene-mann, are a valuable historical source of knowledge of vine orchards. They are used to determine the course of action in the reconstruction of the tradition of the place.
4. Since the beginning of the 21st century, in Poland there has been observed a return to the tradition of vine growing intended for the production of grape wine, especially in the old vine-growing regions.

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Authors' contributions

The following declarations about authors' contributions to the research have been made: study conception: KP; field research: KP, MD, PK; analyzed the data and wrote the paper: KP, MD, PK.

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Uprawa winorośli (*Vitis vinifera* L.) w świetle dawnych traktatów ogrodniczych oraz współcześnie w warunkach Polski

Streszczenie

W państwach Basenu Morza Śródziemnego uprawą winorośli zajmowano się od wieków. Była znana starożytnym cywilizacjom Bliskiego Wschodu, krzewy winne uprawiano powszechnie w Grecji, Rzymie. Winnica stanowiła część ogrodu użytkowego, zajmując zwykle duże obszary i będąc jednocześnie łącznikiem z otaczającym krajobrazem. Pnącze winorośli wykorzystywano również w ogrodach pełniących funkcję ozdobną, jako element roślinny przy różnego rodzaju konstrukcjach i budowlach ogrodowych. Na terenie Polski tradycja zakładania winnic sięga średniowiecza i wiąże się głównie z działalnością zakonników. Nie była tak powszechna jak w krajach południowej Europy. Jednak w polskiej literaturze ogrodniczej oraz tej opisującej rozwój sztuki ogrodowej można odnaleźć wiele wskazówek o sposobach uprawy i odmianach winorośli oraz opisy winnic.

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