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# GRAPE PRODUCTION KNOWLEDGE OF VITICULTURISTS AND SCIENTISTS

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Mireli Martignago, Viviane Kraieski de Assunção and Birgit Harter-Marques

## SUMMARY

*This paper details the results from research on traditional knowledge of descendants of Italian immigrants about grape production, conducted through semi-structured interviews with five wine producers from the community of Palermo in the Lauro Müller municipality, southern Santa Catarina state, Brazil. According to the respondents, they produce the grape in the same way as their parents and grandparents, using knowledge transmitted orally between generations. The wine producers reported that several factors, like the sun and wind are im-*

*portant for choosing the location for planting the grapevines, and they do not exchange nursery trees with other producers despite close familial ties and friendship. The study concluded that the empirical knowledge of wine producers agrees with the data present in the academic literature. Furthermore, the habit of using own genetic material may be causing the emergence of new vine diseases. Thus, we recommend that growers always use nursery trees free of diseases, obtained from certificate nurseries.*

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## Introduction

Immigrants from different countries that came to colonize Brazil in the 19<sup>th</sup> century brought with them diverse knowledge, which was transmitted to their descendants. Descendants of Italian immigrants in the southern Brazilian state of Santa Catarina maintained grape production as a way to conserve ancestral traditions and knowledge. With a demand increase in the consumer market, viticulture became a commercial activity, generating jobs and income in rural properties through the use of family labor (Barni *et al.*, 2007). Yet, families continued to use techniques passed down from generation to generation, transmitted through traditional knowledge (Paterniani, 2001).

Traditional knowledge can be defined as the accumulated knowledge transmitted between generations, developed by various people and commu-

nities, displayed through artistic, literary, and scientific creations, besides the forms that utilize biological diversity (Moreira *et al.*, 2002). These traditions and knowledge are learned through everyday life and direct interaction with the surrounding environment and their natural phenomena (Nascimento, 2013), through observations and empirical experimentation when using available natural resources (Jorge and Morais, 2003).

In recent years, studies by several authors have considered cultures and traditional knowledge as ancient practices that support biodiversity conservation and agricultural practices (Diegues *et al.*, 2000). Traditional farmers contribute to the conservation of agrobiodiversity, in addition to developing the most diverse knowledge about domesticated and cultivated plants, as well as management practices in cultivated ecosystems (Santilli, 2005).

Upon arrival of immigrants from several countries, grape production developed with the introduction of cultivars of *Vitis vinifera* L. and *Vitis labrusca* L., which are currently the most important table grapes of Brazil (Kishino *et al.*, 2007). Currently, viticulture is widespread from the state of Rio Grande do Sul, at 31°S, to the state of Rio Grande do Norte and Ceará, at 05°S. The altitude variation is also significant, with considerable environmental diversity between production zones, including temperate, subtropical and tropical climate regions. Temperate climate viticulture is characterized by an annual cycle, followed by a dormancy period induced by low winter temperatures. It is the traditional viticulture found in southern Brazil and in high altitude regions of southeastern Brazil in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, and

Minas Gerais (Camargo and Guerra, 2005). Expansion of fruit production was primarily due to climatic conditions and differentiated soils that enabled an additional result with enormous potential of products that have differentiated characteristics (Guerra *et al.*, 2005).

Currently, grape production in Brazil covers an area of 80,500ha; the vine is one of the main fruits grown worldwide, with a local annual output of up to 1.5×10<sup>6</sup>t (IBGE, 2015). The *Vitis labrusca* cultivars and hybrids are the basis of table wine and grape juice production, representing over 85% of the volume of industrialized grapes in the country (Camargo and Guerra, 2005).

Grape production is largely dependent on temperature and wind, with temperature being the dominant factor for bud formation. High continuous temperatures are not required and, a pulse of only four to

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**KEYWORDS / 'Bordô' Grape / Italian Immigrants / Traditional Knowledge / Viticulture / *Vitis labrusca* L. /**

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## CONOCIMIENTOS DE VITICULTORES Y CIENTÍFICOS ACERCA DE LA PRODUCCIÓN DE UVA

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### RESUMEN

*Este trabajo resulta de una investigación sobre los conocimientos tradicionales de descendientes de inmigrantes italianos acerca de la producción de uva, realizada a través de entrevistas semi estructuradas con cinco viticultores de la comunidad de Palermo, municipio de Lauro Müller, sur del Estado de Santa Catarina, Brasil. Según los entrevistados, ellos producen uva de la misma forma que sus padres y abuelos, utilizando el conocimiento transmitido oralmente entre generaciones. Los viticultores relataron que diversos factores, tales como el sol y el viento, son importantes para escoger*

*el local de plantación de las parras, y que no acostumbran intercambiar mudas con otros productores, a pesar de los lazos de parentesco y de amistad. El estudio concluye que el conocimiento empírico de los viticultores corrobora los datos presentes en la literatura, y que el hábito de utilizar siempre su propio material genético para los esquejes puede estar ocasionando la aparición de nuevas enfermedades en las parras. Por lo tanto, se recomienda que los productores siempre utilicen esquejes libres de enfermedades, obtenidos a partir de viveros certificados.*

## CONHECIMENTO DE VITICULTORES E CIENTISTAS SOBRE A PRODUÇÃO DE UVA

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### RESUMO

*Este trabalho resulta de uma pesquisa sobre os conhecimentos tradicionais de descendentes de imigrantes italianos com respeito à produção de uva, realizada através de entrevistas semi-estruturadas com cinco viticultores da comunidade de Palermo, município de Lauro Müller, sul do Estado de Santa Catarina, Brasil. Segundo os entrevistados, eles produzem uva da mesma forma de seus pais e avós, utilizando o conhecimento transmitido oralmente entre gerações. Os viticultores relataram que diversos fatores, como o sol e o vento, são importantes*

*para a escolha do local de plantio das videiras, e que não costumam trocar mudas com outros produtores, apesar dos laços de parentesco e de amizade. A pesquisa conclui que o conhecimento empírico dos viticultores corrobora os dados presentes na literatura, e que o hábito de usar sempre o próprio material genético para estaquia pode estar ocasionando o aparecimento de novas doenças nas videiras. Assim, recomenda-se que os produtores sempre usem estacas livres de doenças, obtidas em viveiros de certificados.*

five hours of high temperature is sufficient to induce a maximum number of inflorescences, a necessary condition for fruit formation (Buttrose, 1974).

Given the importance of traditional knowledge and scientific knowledge, a study was conducted with grape producers, descendants of Italian immigrants, to identify their knowledge of the grape production process, such as the factors they consider predominant in choosing a planting location for the grapevine and what influences the grape production. This knowledge was compared to the literature on the subject, in order to contribute to the construction of knowledge that leads to an increase and improvement of traditional viticulture.

### Study area

The study was conducted in the Palermo community, Lauro Müller municipality, which is

home to eight of the twelve grape producers in the municipality (Martignago, 2010). The municipality, located in the southern region of Santa Catarina state, Brazil, possesses an area of 271km<sup>2</sup> with a population ~14,200 people (IBGE, 2012). The altitude varies between <200m in the flood plains of the Tubarão river and its headwaters to 1600m in the higher portions of the mountain escarpment (Santa Catarina, 1986).

The climate type is Cfa, humid subtropical, with hot summers, not defined dry season (Alvares *et al.*, 2014), annual rainfall of 1400mm, and average temperature of 19°C (Santa Catarina, 1991). Cfa has an average temperature in the coldest month lower than 18°C (mesothermal) and an average temperature in the hottest month above 22°C, with hot summers, infrequent frosts and a tendency of rainfall concentration in the summer months,

and no defined dry season (Pandolfo *et al.*, 2002). Clay soil is predominant and the vegetation has characteristics of a Dense Submontane Ombrophilous Forest (Embrapa, 2013; Vibrans *et al.*, 2013).

### Materials and Methods

Through an informal survey in the community, five grape producers were selected that have been producing grapes for more than ten years, in order to collect data on traditional knowledge of grape production.

Semi-structured interviews were the primary method of data collection (Gil, 2008). The interviews were conducted in 2015 and followed a script, consisting of 27 questions previously formulated, which can be modified or adapted according to the flow of the conversation, allowing the researchers to deepen questions or clarify responses. The questions were related to the producers' know-

ledge about grape production, such as how they learned to plant grapes, what the origin of the grapevines was, what conditions they consider necessary for good production, how they characterize a good quality grape, and their knowledge about the ripening and flowering process of the grapevines.

The questions were answered for the most part by the older producers, three men and two women. All interviews were recorded with a field recorder, and objects and pieces related to the studied topic were photographed during the interview. In order to maintain anonymity, interviewed producers were identified as E1 to E5. For data analysis, the content analysis method was used (Bardin, 2004), which consists of three steps: 1) pre-analysis, 2) exploration of the material and 3) treatment of results, inference and interpretation. After transcribing the interviews, the following methodological

procedures were performed: first, the transcribed material was decomposed into parts, which were divided, by differentiation or analogy, into categories chosen from the analysis of the material, such as 'presence of sun', 'absence of wind', 'variety of vines', among others. Then, inferences were made from the semantic dimension; that is, the meaning of the answers. Finally, the interpretation of the senses was performed based on the theoretical basis used in the research (Bardin, 2004).

## Results and Discussion

The grape producers interviewed in this study are descendants of Italian immigrants who initially settled in the municipality of Urussanga, Santa Catarina. They report that the location had a lot of fertile land for grape production. However, after many years producing on the same land, farmers migrated to the Lauro Müller region, specifically to the locality of Palermo, in search of land that could produce in greater quantity and quality. According to the respondents, their ancestors realized that after producing grapes many years on the same soil, the soil wears down, since during that time no soil correction practice was applied. These first immigrants initiated grape production, which is part of the groups' identity construction process in the new territory (Haesbaert, 1999) and served as a reference to the local culture formation, referring to the memory of the immigrants' life before coming to Brazil. All grape producers that participated in the study reside in the community since they were born. Currently, they are 38-60 years old and have on average three children per couple.

Data collected by Martignago *et al.* (2014) on the quantity of grapes produced by the respondents in this study between 2003 and 2010 shows the importance of grape production for family agriculture. In 2003, 33.5t of grapes were produced, and in 2010 production reached 41t.

All respondents stated that they maintained the viticulture artisanal and stressed the importance of the knowledge they learned from their parents and other relatives, all descendants of Italian immigrants. They reported that their ancestors brought the seedlings from Italy to the region. E1, for example, stated that on his property there are vines that were planted 70 years ago by his grandparents, and are cultivated to the present day.

Currently, grape production aids in the producers income; nevertheless it is not the only source of family income. The respondents work in other agricultural activities, among them cattle growing and corn cultivation. With the exception of E5, who works exclusively in agri and viticultural production, the respondents work at or receive retirement from their work in coal mines located in Lauro Müller and other neighboring municipalities. According to them, these other activities represent a way not to depend solely on income from grape production. As one of the respondents stated, "The mine has insurance; rain or shine, you have a salary. There, it is guaranteed. It does not depend only on the crops' time". As noted by Carneiro (1995) the increased supply of alternative employment in urban contexts has led to changes in the agricultural model, which has been characterized by pluriactivity (Schneider, 2003), "constituting a strategy mechanism of survival or expansion of the family's capacities".

All the respondents produce wine and vinegar for sale, which are made on their own properties artisanally. They also state they produce grape juice, however only for their own consumption at home, with the exception of E1, whom encouraged his son to begin grape juice production due to the overwhelming demand for the product, especially for local families and schools, as well as other consumers that go to their properties. The producers do not

advertise their products and, even without advertisement they usually sell all their wine production. During the field study it was found that only a few properties have signs indicating the sale of wine on site. According to the producers, the products become known by 'word of mouth'.

None of the respondents expressed interest in increasing grape production, since it is work that is done by the family. The respondent's children migrated to other activities in the city and neighboring towns, causing a lack of labor in grape cultivation and harvesting. Thus, it is clear that the departure of the children from the field to the city can lead to a decrease or interruption in future activities.

The interviewed grape producers stated that their ancestors arrived in the region bringing a diversity of grape cultivars, such as Isabel, Goethe, White Niagara, Pink Niagara and Terci. E1 and E3 reported that, at the beginning of production, the cultivars Isabel and Goethe were cultivated the most, however as time passed their cultivation was interrupted due to their high susceptibility to disease. Currently only Terci, White Niagara and Pink Niagara are being cultivated. Terci is cultivated in greater quantity compared to the other two cultivars, since both of them have a higher number of diseases and do not adapt as well to the region's climate.

In Brazil, vines are known by local names in some areas. Such is the name of Terci, cited by the respondents in this study, but known as Terci in the state of Paraná, and as Bordô in Rio Grande do Sul and in other locations in Santa Catarina. As noted by the respondents, this variety is a very common cultivar, resistant to fungal diseases (Camargo and Guerra, 2005).

The cultivars Bordô and Terci are treated as the same cultivar in academic literature. However, for two of the respondents, these cultivars possess different characteristics.

Both respondents reported that they acquired this cultivar recently from an institution offering courses on Bordô nursery tree production to farmers that are cultivating it on their properties. The two cultivars have distinct characteristics in color, sweetness, berry size and bunch appearance. According to both farmers, the Bordô grape bunches are more compact but smaller when compared to the Terci cultivar. Furthermore, E1 emphasizes his perception of differences in the produced wine, since that produced with the Bordô cultivar is more full bodied and has a stronger color, which gives the wine more quality. On the other hand, the Terci cultivar produces a 'lighter and thinner wine'. The same producer states that the consumers also perceive these characteristics, since the variety influences the color, and the consumers prefer red wine and vinegar.

According to Tecchio *et al.* (2007), studies conducted to date agree with the statements made by E1 and E5 regarding the production of a more full-bodied wine when using the Bordô cultivar. The authors state that the intense color of the juice or wine is a characteristic of this variety, since the grape has an elevated concentration of anthocyanins in the peel, which are transferred to the wine during maceration. Additionally, Camargo and Guerra (2005) state that the cultivar bunches are small, cylindrical and compact, its berries are black in color, round (spherical), and has a mucilaginous pulp, with a lot of pigments and foxy taste, besides having a high quantity of dyestuff.

For E5, the difference between the Terci and Bordô cultivars is due to Bordô being grafted, stating "if there is a rootstock, the vine roots consequently generate a difference when the plant begins to produce". Similar to the perception of this respondent, the literature establishes a relationship between growth, production, and vine bunch quality with the grafted root. Accord-

ding to Pommer and Maia (2003), grafting is the union of two genotypes, where one forms the plant canopy and the other forms the root system, which influences production with the highest overall plant vigor, ensuring higher vineyard productivity, more drought and humidity resistance, and greater initial plant development that provides larger crops in the early years of production, and improves the vine's quality.

Currently, the number of Bordô cultivar vines is small. Including all the respondents, from the various planted cultivars, it is estimated that the total amount of grapevines is 7500. This is an approximate number, supplied by the producers themselves, who said they did not know the exact quantity.

Before beginning grape production, the producers choose the location which they consider most appropriate for growing. All respondents stated they choose a location because of its greatest sun presence and least wind. E1, for example, pointed out that for a large and continuous grape production, vines should be grown towards the sunrise and cannot face south or east. The ideal position is when the grapevine receives sunlight for most of the day and avoids wind, which would be detrimental, mainly during the flowering period.

According to E4, the sun is a determining factor in choosing location, because the site cannot be damp or dark. The same producer reported that the grapevine can bear a lot of bunches, however they will be small in size; that is, it has no sweetness and does not mature; only a few bunches mature, turning red. However, since the leaves are removed, which hinder maturation, too much sun exposure may cause the fruit to burn, and cause a loss in production, according to the producer.

Some authors highlight the importance of the sun for grapevine growing and ripening fruit. According to Nigond (1967), the vines need clear, sunny days in the growing

season (spring and summer). The author states that between 1200 and 1400 hours of sunlight are necessary during the active growing period. Teixeira (2004) reports that solar radiation acts on the energy process (photosynthesis) and photo-stimulation (movement and formation processes). This factor influences the vine's vegetative cycle and fruit development period. That is, the greater the intensity of solar radiation the better the fruit maturation, promoting higher levels of sugars in the fruit.

Strong winds are a significant problem for vineyard cultivation, since they provoke physical damage to developing grapevines, causing new branches to crack (Teixeira, 2004), which was confirmed by the respondents' empirical knowledge. E2 also highlighted that in order to produce grapes in higher terrains, next to slopes, it is important to plant other vegetation as a form of protection from strong winds.

In addition to the wind, hail, which usually occurs in the region, is also a negative factor for grape production, since hailstones open holes in the leaves that protect the fruits. Already Gobbato (1942) explained that hailstones are very harmful, especially when they occur close to the ripening period, and also cause proliferation of rot and harm vinification. The impacts of hailstone can be mitigated by installing screens in the vineyards, which is not done by the respondents due to lack of financial resources.

When asked about the origin of their vines, all respondents stated that they grow nursery trees on their own properties through cuttings. That is, they clone plants from one another, always from the same cultivar. The producers demonstrate, during interviews, a rejection to cultivating vines that were produced outside their properties. All of them stated that they do not exchange vines between each other, but that they have donated a small quantity of nursery trees, in order for people to grow small

quantities for their own consumption. They also stated that they choose from their properties the vines with better development, greatest production, and greatest berry size for cutting, aiming to obtain highly productive cultivars. The habit of using own genetic material which is old and diseased, may be inducing the emergence of new vine diseases and pathogens, thus causing a weakening and reduction in fruit biomass over time (Carlini-Garcia *et al.*, 2013). Thus, it is recommended that growers always use nursery trees free of diseases, obtained from certified nurseries. A grapevine root parasite named filoxera caused in 1860's France great losses in wine production (Nass *et al.*, 2001). Since there were no grape genotypes resistant to the parasite, the solution was to graft roots of a wild grape type, which was resistant to the insect.

Indirectly, the respondents themselves proved that they propagated diseased material. They stated that the grapevines have been showing more and more diseases compared to the earlier years of fruit production on their properties, and that there is presence of new diseases in recent years. However, the growers do not perceive that they are using old and diseased material for cutting, propagating diseases and pathogens over time. Among the diseases, one organism was cited which appears to be termites, or an insect that enters the plant and sucks all the liquid and dries the grapevine, leaving only a resin, generating total plant loss. The newly planted grapevines on the property would be more susceptible to the presence of this termite compared to older vines. According to consulted specialists in the area, it is not termites but a fungus that comes from the soil and is currently being studied, but no specific treatment for the problem has been found yet.

The respondents also reported the emergence of a new disease in recent years, downy mildew. They state that le-

sions appear on the leaves, in the form of patches and, if not controlled, the process reaches the fruit, yellowing the berries and causing total fruit loss. Downy mildew is caused by *Plasmopara viticola* (Berk. et Curt.) Berl., one of the main fungal vine diseases (Amorim and Kuniyuki, 2005). This disease causes losses that can reach 100% of the vineyard production, especially in years with elevated precipitation, high humidity, and long periods of humidity of the leaves and fruits (Madden *et al.*, 2000). According to Amorim and Kuniyuki (2005), the symptoms appear mainly on the leaves, and are initiated by damage of the mesophyll, referred to as 'oil stain', a pale staining, and with time the infected area necrotizes and severely infected leaves fall, confirming what the respondents cited.

Besides the downy mildew, another disease was reported, anthracnose, which attacks the berries. According to Amorim and Kuniyuki (2005) the disease is caused by the fungus *Elsinoe ampelina* (de Bary) Schear, and it appears soon after bunch development. The attack may occur in the berries, confirming the reports of our respondents. The same authors state that the disease manifests itself through depressed circular spots, necrotic and isolated, with a gray center and brown-red edges, and is known as 'bird-eye'.

## Conclusion

Wine production is very important in the community of Palermo as a source of income and a form of maintaining traditional knowledge. According to the respondents, they produce grape the same way as their parents and grandparents, using knowledge transmitted orally between generations. The wine producers reported that several factors, like sun and wind, are important for choosing the location for planting the grapevines, and they do not exchange nursery trees with other producers despite

close familial ties and friendship. We could show that the empirical knowledge of wine producers agrees with the data available in the academic literature. Furthermore, the habit of using own genetic material may be causing the emergence of new vine diseases. So, we recommend that growers always use nursery trees free of diseases, obtained from certified nurseries.

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