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New genomic techniques, plant variety rights and wine law

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Abstract. The paper discusses potential implications of New Genomic Technologies (NGTs) on European Plant Variety and Wine Law. It first analyzes the legal notions of variety in the Community Plant Variety Right System and Wine Law. It then describes the ongoing legislative efforts to facilitate the use of NGTs in the EU as well as their implications for Intellectual Property Rights. It finishes by proposing to disentangle the notion of grape variety in Wine Law from the variety designations under Plant Variety Law. This could preserve the high recognition of established varieties without compromising legitimate consumer expectations in wine authenticity. At the same time, it could contribute to intravarietal diversity and the sustainability of viticulture in light of new technological and climatic realities.

1. Introduction

Climate change increasingly affects wine production in almost all relevant production areas [1,2]. Irregular precipitation patterns and earlier veraison cause higher fungal disease pressure. At the same time, stricter regulations, demands from "conscious" consumers and increased fungicide resistance limit the possibilities for plant protection.

Fungus-resistant varieties ("Piwis") are seen as potential solutions to address these challenges. The European Union (EU) has recently paved the way for using them in wines sold under Protected Designation of Origins (PDO). Still, significant legal hurdles remain. Many PDO product specifications explicitly require the use of specific varieties, for example Pinot Noir in the case of AOC Bourgogne [3]. Depending on various factors, consortia and national authorities are more or less likely to allow for greater flexibility [4]. Even if allowed, winemakers hesitate to move away from famous varieties because of their high recognition and reputation [5]. They want to produce Pinot Noir, just as consumers want to drink it [6].

Another solution could therefore lie in modern biotechnology and precision breeding, in particular in applying New Genomic Techniques (NGTs) to enhance the resilience of existing varieties, for example by knocking out certain susceptibility genes for fungal disease [7–10]. Efforts in this direction are supported by the EU and the International Organization of Vine and Wine (OIV), but many questions remain on the concrete technical and legal feasibility of NGTs use.

This paper analyzes the legal identity of grape varieties in light of recent developments in biotechnology. It shows how technological progress causes legal disruption [11] and puts in question the foundations of an Intellectual Property (IP) and consumer protection systems developed in the 20th century (much like digitalization and artificial intelligence challenge the patent and copyright systems). A more flexible approach may be warranted to reconcile the interests of breeders, sustainability goals and consumer demands.

2. Variety as a legal concept

Variety is a social construction, not a biological reality. It refers to a more precisely defined group of plants within a species which shares certain characteristics. It is also a legal term. Two different legal areas are of particular importance. Plant Variety Law, as a subfield of IP law, and Wine law, as a subfield of agricultural and food law.

2.1. Plant Variety Law

In the EU, the system of community plant variety rights (CPVR) under Regulation (EC) 2100/94 creates a framework for plant breeders' rights in line with the international UPOV conventions (Union Internationale pour la protection des obtentions végétales). The CPVR represents a sui generis IP system that seeks to strike a

balance between the rights of breeders, farmers and the wider interest in promoting innovation.

Article 19 of Regulation (EC) 2100/94 grants plant breeders the right to commercially exploit new varieties for a period of 30 years. The so-called breeders' exemption allows other breeders to use the variety when developing new ones. The legal definition of variety in the CPRV framework is based on the so-called DUS criteria (distinctness, uniformity and stability). The DUS criteria are taken up in Article 2(1)A Council Directive 68/193/EEC on the propagation of vine varieties, which sets various requirements to ensure "varietal identity and purity".

Varieties are usually distinguished by ampelography, i.e. phenotypical criteria [12], or by genotyping [13]. Scientific databases, especially the VIVC by the German Julius-Kühn-Institute, play an important role in practice, but do not actually have a legal value. Old varieties, like Pinot Noir, are not subject to the CPVRs rights. However, they serve as a reference point when defining new varieties according to the DUS criteria.

2.2. Wine Law

For most wine producers and consumers, questions of IP law are irrelevant. Vintners buy grapevines from nurseries. They care about how the variety behaves in the vineyard, cellar and the shelf. Consumers buy wine bottles and care about what is written on the label. All of these aspects are regulated by wine law.

The basis of European wine law lies in agricultural law, in the Common Market Organization Regulation (EU) 1308/2013. Various delegated and implementing acts cover production-related aspects including mandatory authorization schemes for plantings, national vineyard registers, documentation of wine transports, stock and harvest declarations as well as an isotopic database for authenticity control. Delegated Regulation (EU) 2019/934 specifies ingredients, additives, enrichment, and specific oenological practices.

With regard to grape varieties, Articles 81 and 82 of Regulation (EU) 1308/2013 specify that wines must only be made from classified varieties. The classification is conducted at the member states level. Wines from non-classified varieties may only be used for domestic consumption, distillation or vinegar production. Certain derogations apply for the planting, replanting or grafting of wine grape varieties for scientific research and experimental purposes.

At the same time, wine law can also be considered as a subfield of EU food law, specifying various aspects of wine labelling, especially Geographical Indications (GIs). In fact, the product specifications (or "cahiers de charges") of GIs are probably the most important regulation for individual winemakers. They are created in a unique, bottom-up system by local producer organizations themselves.

As for variety labelling, Article 50 of Regulation 2019/33 specifies that a variety or its synonym can only be named if at least 85 % of the product is made from it. Names shall be those specified in the national variety classification, or – for third country imports – in variety lists by the OIV, UPOV or the International Board for Plant Genetic Resources. These rules are interpreted strictly. For example, the Higher Administrative Court of Germanys main production region of Rhineland Palatia ruled that the abbreviation Pinot must not be used even for a wine entirely made from varieties belonging to the Pinot family like Pinot Gris [14].

Additional rules on variety label are set at the national level or in the individual GI product specifications. In Germany, for example, labelling famous grape varieties is only allowed for wines which carry a GI.

3. New genomic techniques in vine breeding

NGTs are usually defined as those techniques that are able to precisely alter the genetic material of an organism without introducing foreign genetic material [15]. The most prominent set of NGTs relies on the use of the CRISPR-Cas technology, that allows for precise site-directed genetic modifications. CRISPR/Cas9 has been increasingly applied in grapevine breeding since its efficacy was first demonstrated [16]. Researchers are optimizing the system to improve editing efficiency and also explore alternative CRISPR tools like CRISPR/LbCas12a for gene knockout and CRISPR/Cas13a for RNA targeting [17,18]. So-called base and prime editing enable precise genetic modifications [19,20]. Based on a better understanding of the underlying biological processes, NGTs could thus be used to enhance disease resistance, regulate plant growth, and modify secondary metabolite production [10],[17],[21–24].

3.1. NGT regulation in the EU

Despite the promises of gene editing, regulatory and political challenges persist [25,26]. In particular, the regulatory framework in the EU presents a significant barrier to using NGTs for practical plant breeding. On 25 July 2018, the European Court of Justice (ECJ) ruled that plants bred using NGTs qualify as Genetically Modified Organisms (GMOs) [27]. Hence, they are subject to a strict authorization regime to ensure that their release does not constitute a risk to human health, safety and environment as well as to strict labelling and observation requirements.

The ECJ decision has been subject to criticism by large parts of the scientific community. NGTs exhibit similarities with traditional mutagenesis techniques commonly used in plant breeding in the last decades [28]. They do not necessarily encompass the inclusion of foreign genes from other organisms (transgenesis), as in most cases they simply involve a modification of the plant genome (cisgenesis). Mutagenesis techniques and cell fusion of plant cells of organisms that can exchange genetic material through traditional breeding methods are

explicitly exempted from the GMO framework by Article 3 of Directive 2001/18/EC. The ECJ, however, considered this so-called "mutagenesis exemption" applicable only to techniques that have "conventionally been used in a number of applications and have a long safety record". This decision has been criticized for ignoring the technological complexities of such definitions [29] and for being based on technically implausible assumptions, as the use of NGTs cannot reliably be detected [7],[30]. It has lead to fears of an evasion of EU biotech companies and researchers [31] and calls for reform of the GMO framework [32].

In 2023, the EU Commission indeed published a proposal to exempt certain NGT plants from the GMO regulation [33]. According to the proposal, plants obtained through NGTs would be divided into two categories, enjoying a different treatment: The majority of NGT products would fall under the so-called Category I and be considered equivalent to conventionally bred plants because the changes introduced in the genome could occur naturally or produced through conventional breeding methods. This proposal has been supported by the European Parliament in 2024 and was endorsed by the Council [34]. In March 2025, a qualified majority in the Council agreed on a negotiation mandate for interinstitutional negotiations (« trilogue ») from May 2025.

Still, some voices also argue maintaining a more restrictive regulation for NGTs, emphasizing environmental and health risks, and potential consequences for IP rights [35] as wellas potential conflicts with international law [54].

In the meantime, some EU member states, such as Italy, have already moved ahead by allowing the use of NGT plants in experimental field tests: grapevines resistant to downy and mildew were planted in Valpolicella by researchers of the University of Verona [36].

3.2. Effect on Intellectual Property Rights

The use of NGTs could affect the IP rights architecture in various ways. With regard to Plant Variety Rights, NGTs could put into question the "distinctness" criterion, as they allow for precise mutations on single genes that do not necessarily have distinct features [37]. At the same time, there may be a tendency to seek patent protection for NGT techniques and NGT-derived products. Patents could protect specific genetic traits, gene-editing methods, or even the resulting plants themselves. Patents are problematic because they do not foresee a breeders' right exemption, like CPVRs, meaning others cannot freely use patented traits for further breeding, unless a license is granted [37]. This could stifle progress in plant breeding. Also, NGTs-derived modifications could potentially occur naturally, opening up ethical controversies on the patentability of what could be a "natural" mutation, leading to controversies similar to the infamous Calsberg's patent on "Beer without Dimethyl-Sulfide off-flavour" based on a genetic variation in the Barley genome [38].

The increased number of overlaps and interactions between CPVRs and biotechnology patents have led to contrasting opinions among the breeders themselves on what constitutes the optimal regulation [39]. In the EU's most recent proposal, NGT Category I plants are considered equivalent to conventionally bred plants, thereby allowing for the application of a breeders´ exemption [34].

4. An autonomous notion of variety for Wine law

The effect of NGTs on IP Law can be considered as an example of legal disruption. Legal disruption occurs when rules do not keep up anymore with technological developments and societal paradigms [40]. It can be minor or major, leading only to certain specific adaptations or creating the need for entirely new frameworks [41]. In the case of grape variety labelling, we believe that the conundrum may be resolved by disentangling the notions of variety in Plant Variety and Wine Law.

4.1. Disentangling CPVRs and Wine law

As described, EU law uses the term variety in different contexts and for different purposes. Plant Variety Law, as part of IP law, seeks to incentivize and compensate breeders. Wine law, as part of European agricultural and food law, seeks to promote a healthy wine sector in line with public priorities and ensure adequate consumer information. An autonomous notion of variety in wine law would allow the (re-)construction of the IP framework to accommodate NGTs, without jeopardizing the market for specific products.

An autonomous definition would not compromise legal coherence. In fact, it is an exception that wine law links variety labelling to plant variety law. Under UPOV guidelines, the unique plant variety denomination (PVD), which remains associated with it even after the expiry of breeder´s rights, is primarily meant to be used when selling plants to nurseries and eventually producers. It is not necessarily the name used for selling plants to consumers.

In the case of apples, for example, variety names are commonly displayed to consumers, but do not precisely match PVDs. Popular names like "Elstar" are used for several essentially derived varieties such as Elshof or Red Elstar [42]. Breeders also increasingly turn to brand names. "Pink Lady" for example is brand under which several varieties are marketed, including "Cripps Pink", "Rosy Glow", and "Lady in Red": Such a combination of IP instruments is even encouraged by CPVO representatives [43], as it allows breeders to reap several benefits: They can register new varieties under clearly distinct named or even just codes. At the same time, they can protect recognizable names as trademarks that may even cover multiple varieties with shared qualities. This allows for better protection against similar names and the creation of intangible assets that can be promoted, licensed, franchised, or sold. Consumers are protected by the general prohibition of misleading practices.

An independent notion of variety would also not compromise the quest for authenticity as one of the most important and noble objectives of wine law. European Law generally assumes a "reasonably well informed, observant and circumspect consumer" [44]. The European wine consumer might be a bit more special in this regard and can legitimately expect a very high degree of authenticity even for aspects that cannot reliably be tasted, such as vintage. Still, wine law does not foresee authenticity at a molecular level. A variety can already be named on the label, if at least 85 % of the product is made from it.

4.2. A diverse and dynamic notion of variety

An autonomous notion of variety in Wine Law should reflect the reality that grape varieties are not homogenous or static [45]. Especially old varieties like Pinot Noir show a broad intra-varietal diversity with dozens of clones currently used for breeding and propagation [45,46]. Each of these clones is undeniably an expression of Pinot Noir and contributes to the varietal perception of winemakers and consumers. The clonal diversity has been exploited for centuries, and wineries even relate specific attributes to individual clones [47].

Intra-varietal diversity is also increasingly seen as a prerequisite for resilience and polyclonal selection is seen as a key tool to ensure the sustainability of viticulture [48]. A quest for diversity is therefore underpinning recent policy initiatives such as the EU's latest proposal for a new regulation on plant reproductive material [49]. NGTs could be used to create new clones and add to intra-varietal variation in line with sustainability goals.

Unlike the current NGT reform proposal, Wine law does not need to limit varietal development to a certain number of base pair changes. A single point mutation, induced through prime editing, has been shown to create a distinct "Muscat-like flavor" that clearly changes the wine profile [20]. At the same time, improvements related to drought and disease tolerance may require complex mutations, without affecting consumer perception at all. Varietal typicity by taste, which is already taken into consideration in quality evaluations and many GI specifications [50], could therefore be a more adequate criterion.

A lot of the resistance against NGTs seems to be driven by a fear of unnaturalness [51]. However, wine law should not fall into the trap of considering NGTs as less "natural" than previous breeding methods [52]. The wine we enjoy today is a product of human intervention and ingenuity. Even the most natural wine remains an artificial creation, a human product, reflecting centuries of scientific development. The notion of variety in Wine law should hence integrate this diversity as well as its dynamic. Why should the name of varieties like Pinot Noir be restricted to a certain number of clones at an arbitrary point in time, when it has developed continuously over centuries?

5. Conclusion

The unique multi-level and bottom-up structure of Wine law can contribute to the identification of sustainable solutions [53]. It has thus become a trailblazer in integrating sustainable innovations such as fungus-resistant varieties [4]. Paving the way for a sustainable use of biotechnology to improve existing varieties would be a logical extension of this program.

It would also be in line with the Policy Recommendations issued in December 2024 by the EU's new High-Level Group on Wine Policy which requested that « *the forthcoming revisions of the EU legal framework for wine explore all options to adapt the rules, including inter alia on definitions […], to facilitate the marketing of grapevine products […], while preserving the integrity of the sector and preventing damages to the long-standing good reputation of EU wines.* »

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