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SITUATION OF AUTOCHTHONOUS VARIETIES IN FRENCH VITICULTURE

Abstract: In March 2018, the official French Catalog includes 380 grape varieties, all categories included. 192 of them are considered as traditional autochthonous varieties, among 400 known and maintained in the genetic repositories.

This wide varietal diversity, inherited from two millennia of cultural traditions, is broadly exploited by the different French wine regions, and is an essential element of their originality and reputation. In addition to the most famous French varieties, sometimes widely spread in the world for a long time, there is an increasing interest for the re-cultivation of neglected minor varieties.

Since 1919 (first law to mention grapevine varieties as an integral part of the conditions of production for Appellation of Origin), the legislation built a restrictive framework which, at first glance, gives limited possibilities for the use of varieties not officially recognized. However, changes are progressively taking place with the realization of numerous projects on historic neglected grape varieties in all different French vineyards, which rely both on the networks of conservatories set up by the local Partners of the French Selection, and on individual approaches of vine growers. This trend is accompanied by a dynamic work of prospection and conservation, which regularly offers the discovery of rare or genetically unknown varieties in very ancient plots. Finally, the plant material implanted in the collections, whose sanitary status is frequently checked, gives the growers opportunities to grow plants free from serious pathogens and whose identification is incontestable.

Key words: *autochthonous varieties, diversity, adaptations, genetic repositories, varietal assortment*

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INTRODUCTION

In France, as in any ancient vine-growing countries, the grapevine varietal assortment showed during the times a continuous evolution. Many varieties appeared, were selected and then vegetatively propagated, travelled with men, and sometimes disappeared from their birthplace. Consequently, it is often very difficult to define with certainty the native or indigenous character of a grapevine variety. The rigorous definition of these two synonymous terms is “an individual from the country where he lives”. If we try to apply this definition to an ancient grapevine variety, immediately arises the insurmountable obstacle of the knowledge of the birthplace of the initial seedling which is at the origin of the cultivar by vegetative propagation. With few exceptions, the original seedlings are not reported in the literature, especially when the variety is old. Very often, a traditional grape variety could become famous (or was even simply named) only after a significant propagation, that is to say when the memory of its “origin” had probably already been erased.

Several possibilities are then available to attribute a variety to a vine-growing area, and consider the latter as the “historic cradle” of the cultivar. A reasonable choice, on the basis of concordant informations between the bibliographical references, the living tradition and the study of old vines, is to consider the belonging of a variety to a local heritage for example when its former presence is highly probable, unique or previously to other regions, if it was propagated in the near area and cultivated without interruption since its first mention, with several offspring, etc.

All these elements do not avoid many difficulties, due in particular to the reliability of contradictory old references, or to the scientific advances which made it possible to determine unsuspected kinships and synonymies.

In France, according to the scale proposed by Thierry Lacombe [1], we can classify the traditional varieties in 4 categories, depending on the cultivated surface:

- More than 1000 ha: propagated variety, national importance,
- From 100 to 1000 ha: local importance in one or several vineyards,
- From 10 to 100 ha: minor variety, with very local propagation,
- Less than 10 ha: considered as endangered variety...

The importance of autochthonous varieties in the different French vineyards has long motivated works that have made it possible to improve the knowledge, to preserve them, then select them and provide diversified and qualitative plant material to the growers [2], [3].

SITUATION OF GENETIC RESOURCES IN FRANCE

According to the census made from the INRA Vassal collection and bibliography [4], 560 cultivars from *Vitis vinifera* L. can be considered as autochthonous in France, including mutants and recent crossings from the early 19th century to nowadays. Among them, about 400 are traditional ancient varieties. Outside the Vassal repository, many of them are preserved in the network of conservatories set up by the local Partners of the French Selection (180 plots located in the French vineyards).

To date, 380 grapevine varieties are registered in the French official Catalogue [5]. 295 are used for winemaking, 85 for table grapes, juice or double use. 192 are considered as autochthonous traditional varieties. Almost half of them, even officially allowed for cultivation, are planted on less than 10 ha (87 cultivars, i. e. 45 %) (Figure 1).

Only 20 varieties represent 87% of the total surface of the French vineyard [6], of which 5 are from neighboring countries (Figure 2), as an illustration of the travel and acclimatization of varieties.

At the other end of the scale, more than 200 minor cultivars are not listed in the Catalog. Considered as “collection varieties” they are maintained in the national repository of Vassal, and currently in local conservatories in the viticultural areas. They are only present in the vineyard as traces, or have completely disappeared. Their names, cultural traits and bibliographic data, when available, are kept with the genotypes, and their genetic profile is included in the INRA/IFV database, which now has 8,000 unique profiles all categories included.

And every year, many surveys are organized in the oldest plots of French regions or in the remains of ancient vineyards, and unknown varieties are

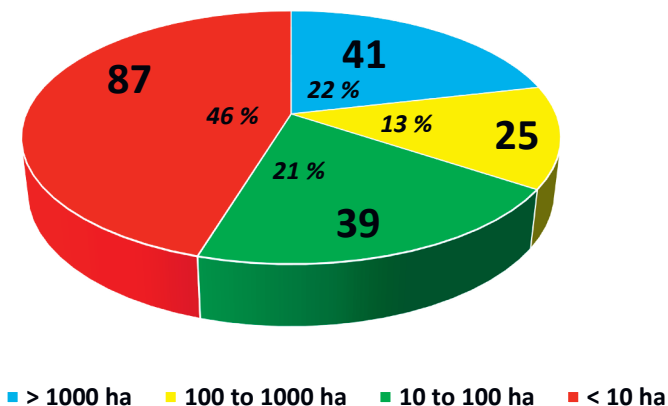


Figure 1. Repartition of the 192 registered autochthonous French cultivars

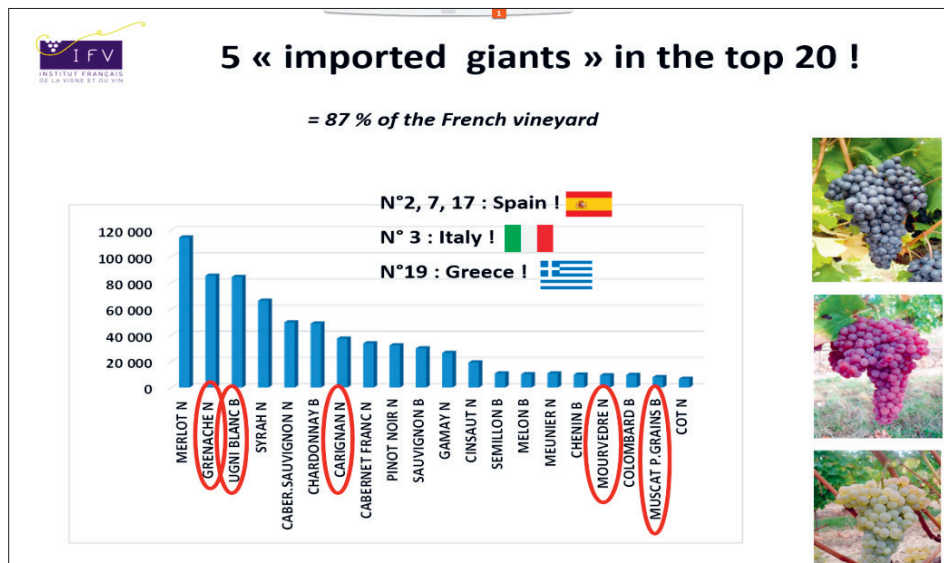


Figure 2. The “top 20” varieties planted in France (2016)

regularly discovered and preserved. We can consider that a real and important reservoir of diversity stands at grower’s fingertips.

CAN WE EVALUATE THE GENETIC EROSION IN FRANCE AT LEAST FROM THE 19TH CENTURY?

The phylloxera invasion during the late nineteenth century led to a considerable loss of surface for the French vineyards, with the disappearance of a family viticulture rich in diversity [7]. The consequences in terms of reconstructions generated brutal events leading to strong genetic erosion of cultivated grapevine: I) varietal strategies for fewer planted varieties, leading sometimes to drastic varietal choices, II) definitive loss of some secondary varieties, III) propagation from limited resources in plant material and then IV) development of sanitary and agronomic selections, with cultural rationalization.

Since the 1950’s and the establishment of a viticultural land registry, the evolution of the grape varieties is precisely known. It shows a strong evolution towards the reduction of the number of varieties significantly planted. But this trend has been stabilized for about 20 years, and today we can note a keen interest for diversity, that regularly results in the re-cultivation of neglected varieties.

An approach to the genotypes loss suffered by the French germplasm is given by Thierry Lacombe [8], from the study of the relationships between 2344 genotypes maintained in the Vassal collection. 168 missing links can

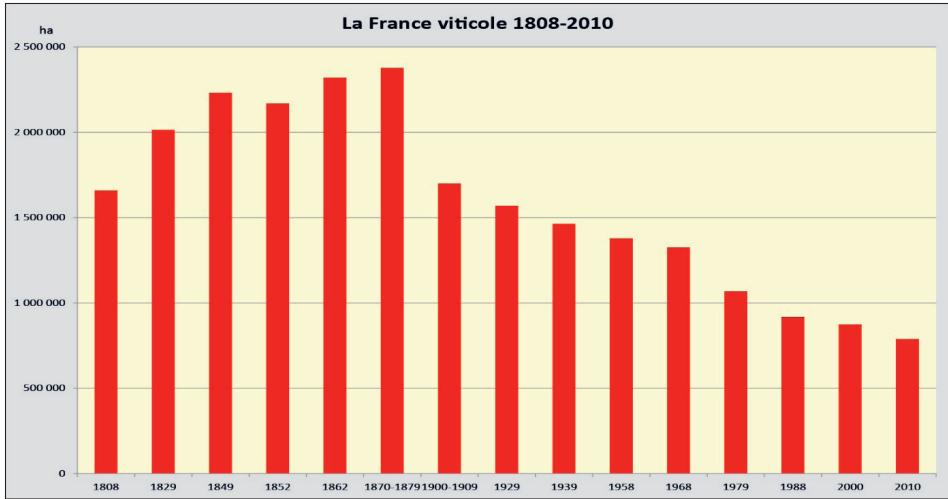


Figure 3. Evolution of the total vineyard surface in France (Legouy 2014)

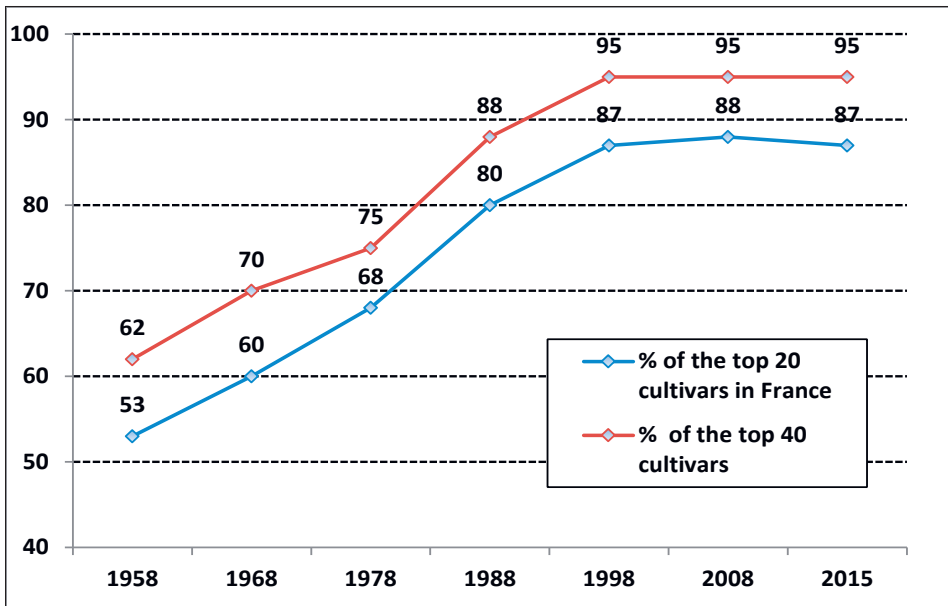


Figure 4. Proportion of the 20 and 40 top cultivars in the total surface of the vineyards

be highlighted in the genealogic trees from “ancestor” cultivars, which makes it possible to estimate varietal genetic erosion at about 40% since a “recent” period (Middle Ages?). This figure is probably overestimated, as a same genitor can occupy several empty spaces in the trees, and a certain number of genotypes found since 2012 may fill some gaps when a new large study will be conducted incorporating these original profiles.

THE ORGANIZATION OF THE PRESERVATION OF GRAPEVINE GENETIC RESOURCES IN FRANCE

Since 1944 and the creation by Professor Jean Branas (Montpellier) of the first system of control and selection of grapevine plant material [9], several important steps have marked the gradual structuring of conservation in France:

— 1946: creation of INRA, whose centers in Colmar and Bordeaux will be the first historical actors in conservation,

— 1949: creation by Jean Branas of the Domaine de Vassal, from the collection initiated in 1879 by Gustave Foëx at the Montpellier Agricultural School [10],

— 1959: creation by the Agriculture Minister Edgar Pisani of technical services in the local administrations of agriculture, which will quickly undertake works in the great vineyards,

— 1962: Creation (still by Branas!) of ANTAV in the sands of the Domaine de l’Espiguette (now the Plant Material Pole of IFV, in Grau du Roi), from which will emerge the first clones registered in 1971 [11].

Inherited from this historical path, the conservation of grapevine genetic resources in France is organized in three complementary levels:

1. The national and international ampelographic collection of Domaine de Vassal, which contains today more than 8000 genotypes, including 2,760 *Vitis vinifera* L. cultivars from 54 countries. Many fundamental missions are assigned to the collection:

— Preservation of the widest genetic diversity,

— Conservation of genes of interest (resistance, agronomic behavior, mutations, etc.),

— Archiving reliable references for the identification of varieties (ampelographic descriptions, herbaria, DNA profiles, documents...),

— Maintaining genotype references, and achieving official descriptions,

— Supplying plant material for research, selection, varietal creation, grower’s plantings...,

— Organization of surveys in France and outside, thanks to the reference ampelographs Jean-Michel Boursiquot and Thierry Lacombe.

2. The national repository of the initial plant material of selected clones (Domaine de l’Espiguette, IFV). The activities of the pole go far beyond conservation:

— Sanitary selection (ELISA testings, PCR, indexing),

— Maintenance of the initial plant material of the registered clones, as well as many accessions of the cultivars listed in the Catalog, and of foreign varieties,

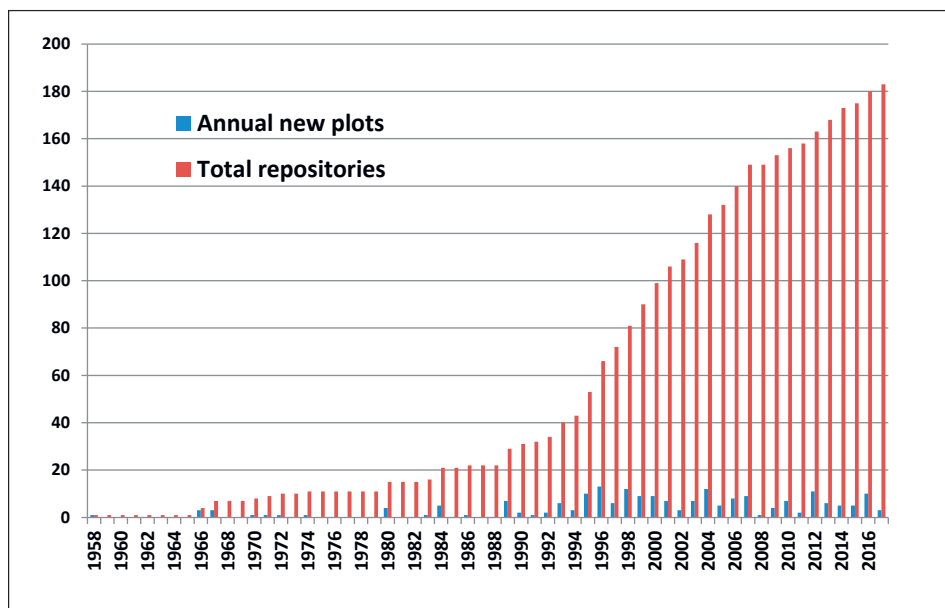


Figure 5. Evolution of the number of genetic repositories in France

— Coordination of the network of Partners of the French Selection with INRA,

— Support for work in the regions (surveys, expertise, selection of clones and registration of varieties...),

— Supplying plant material to nurseries, growers and technical organizations (categories “initial”, “base”, “experimental”),

— Management of research programs (genetics, virology, nursery process...).

Since its creation, more than 19,000 clones have been introduced and tested; about 5,500 are currently maintained, representing more than 500 varieties (wine and table grapes, rootstocks).

Annual introductions continue at the rate of 100 to 250 clones of French or foreign varieties [12].

3. Regional clonal repositories: 180 plots established in the different vineyards maintain intra-varietal diversity of 130 cultivars, for a total of about 20,000 accessions. They constitute a great reservoir for the ongoing selections intended to increase the range of diversity of the propagated clones.

They are the result of the work of the 35 Selection Partners (including 19 Departmental Chambers of Agriculture), gathered around IFV and INRA.

Since 2005, in order to assure to this important work a common traceability, a database has been set up and filled in by the partners. It lists the complete collections and many data concerning the accessions maintained (location, origin of prospection, sanitary status...) [13]

THE VALUATION OF THIS HERITAGE: TO KNOW, TO MAKE KNOWN, TO MAKE AVAILABLE

Three scenarios can be distinguished, depending on the regulatory status and the presence of the variety in the vineyard.

CULTIVARS REGISTERED IN THE CATALOG AND WIDELY USED, ESPECIALLY IN AOP

These varieties have repositories in which many accessions have been gathered, and it is likely that at least part of their natural variability, born of random mutations during centuries of vegetative propagation, has been preserved. A lot of work has been done and is still ongoing, which aims to study and exploit by clonal selection the intravarietal diversity [14]. A dozen new clones are approved each year, enriching the palette of 1,200 selections already listed in the Catalog. The objective for these main varieties is to make a wide range of agronomic behaviors available to growers, and to offer all the possibilities for adaptations that may exist within the cultivar.

After 50 years, we can consider that, for the most economically important varieties, 3 generations of clones have been selected with diversified objectives:

— Firstly, virus free selections ensuring a regular yield (Chardonnay B 76, 96, Pinot Noir N 114, 459...),

— Then clones with more moderate yield, mainly for appellations (Chardonnay 548, Pinot Noir 777, 828, 943...),

— Finally, “additional range” clones for diversification (Chardonnay 1066, 1067, Pinot noir 1185...). But for many varieties, selection is not yet satisfactory and is still in process, in order to represent as completely as possible the diversity sometimes born of centuries of multiplication.

VARIETIES REGISTERED IN THE OFFICIAL CATALOG, BUT HARDLY OR NO MORE USED

The valorization of these varieties generally requires the acquisition of new experimental results, according to objectives sometimes redefined. For example, some productive red grapes, formerly banned from appellations because of the poor quality of their red wines, may be of interest for the production of rosé wines, or even of reds with small degrees and low concentration in tannins. In this category, we also find cultivars for which very few references are available. For these varieties, sometimes likely to be quite quickly cultivated again, another challenge is the supply of safe plant material to the growers. If the certification of virus-free clones and their multiplication can't be achieved quickly enough to meet a nascent demand, solutions can

be provided by the propagation of controlled material in “standard” category, for example from safe plants maintained in conservatory or in experimental plots. The purpose of the work is to ensure the availability of a broad variety assortment, with as complete references as possible, in order to meet needs using original resources.

GRAPE VARIETIES NOT REGISTERED IN THE OFFICIAL CATALOG

For these varieties, there is frequently a problem of plant material: in general, very few vines are maintained in collection, which is a limiting factor for replantation projects. More, the only known accessions are sometimes affected by serious virus diseases. The priority in this case is to introduce these varieties into collections as soon as they are found in good sanitary condition during surveys, or to carry out sanitations when this is not the case, by combining thermotherapy techniques and apex cultures.

Once this step has been completed, observations and measurements are carried out in a collection (general description of the varieties, phenology, maturity, production, particular agronomic behaviors, etc.). This work is done at the INRA Vassal domain, and in regional repositories, where known grape varieties can provide landmarks for the parameters. Finally, if the data collected are insufficient to obtain the registration of a cultivar in the Official Catalog, a regulatory condition prior to its re-cultivation, it can be necessary to establish test plots with a protocol to support a technical file (determination of the “Agronomic, Technological and Environmental Value” of the variety). The establishment of these experimental plots is generally the result of a collaboration between an organization (IFV, Chamber of Agriculture...) and a grower interested in the cultivation of one or more old neglected grape varieties [15].

As an illustration, 24 indigenous grapevine varieties originating from several French wine regions have been registered in the national Catalog the last 10 years.

There is undoubtedly, as in many neighboring countries, a strong interest for the re-cultivation of forgotten varieties. This phenomenon arises from the interaction of two reasons: from consumers, where more and more consumers to want to taste different wines, having a history in connection with a territory, and from growers and winemakers, where they are eager to bring to light a original heritage and to offer unique or rare products.

Thanks to the central role of Vassal’s national INRA collection, traditional resources are increasingly better referenced (DNA profiles, ampelography, sanitary status) and evaluated. The examination of the genetic relationships also makes now possible to specify the historical outlines and to

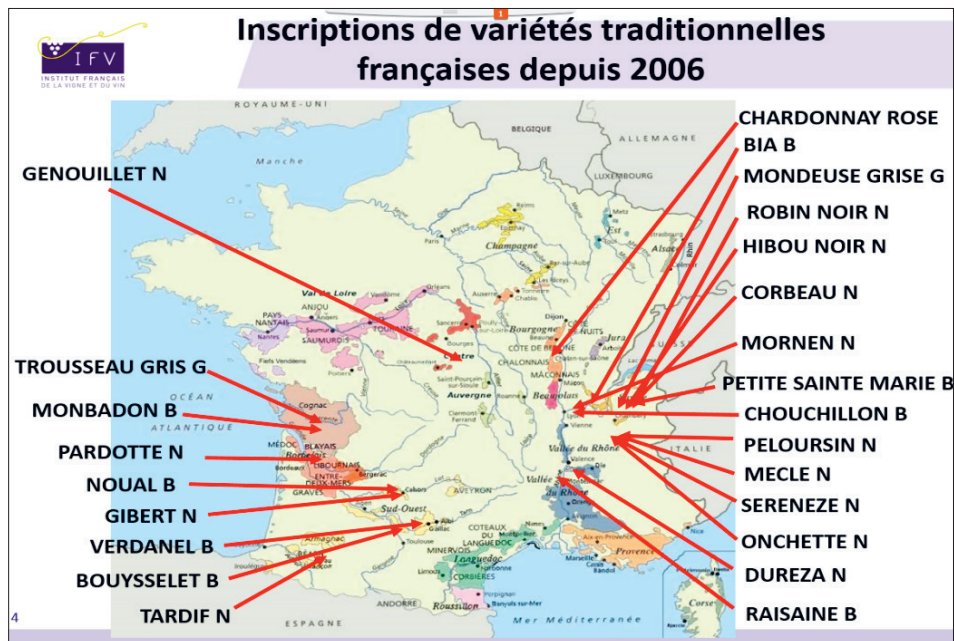


Figure 6. Traditional neglected varieties recently registered in France

provide references that can serve as a communication tool for the winemakers. For example, several attractive posters were recently made with schemes explaining how the famous varieties can be related to completely unknown local cultivars.

CONCLUSION

Today, the use of historical resources from the national territory is common in France, but the need to adapt to climate change and the development of disease-tolerant varieties are likely to change the balance of new plantations in the near future. Many foreign varieties supposed highly tolerant to drought and heat were registered these last years (from Greece, Spain, Italy, Portugal...), and the first varieties with polygenic resistances for downy and powdery mildews (issued from the INRA-RES DUR program) have been registered in January 2018. Many other cultivars, tolerant or resistant to cryptogamic diseases obtained in other countries are also available, and this varietal offer is going to increase in the next years, given the numerous ongoing breeding programs. What will be the main trends in the coming decades? The future will speak, but the strong societal pressure for the reduction of phytosanitary inputs is likely to strongly disadvantage, in the medium term, the traditional *Vitis vinifera* L. varieties throughout our old Europe.

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PREGLED AUTOHTONIH SORTI VINOVE LOZE
U FRANCUSKOM VINOGRADARSTVU

Sažetak

U martu 2018. godine službeni francuski katalog je obogaćen sa 380 sorti vinove loze, uključujući sve kategorije. Od njih 192 sorte se smatraju tradicionalnim autohtonim sortama, među 400 poznatih i održavanih sorti u genetskim kolekcijama.

Širok obim sortne raznolikosti potiče iz kulturne tradicije duge 2 milenijuma i rasprostranjen je u različitim francuskim vinskih regijama, pa je zato bitan element njihove originalnosti i ugleda. Uz najpoznatije francuske sorte, široko rasprostranjene u svijetu već duže vrijeme, postoji sve veći interes za rekultivaciju zapuštenih manje zastupljenih sorti.

Od 1919. godine (prvi zakon koji spominje sorte vinove loze kao sastavni dio uslova za proizvodnju u skladu sa Sertifikatom za označavanje porijekla), zakonodavstvo je izgradilo restriktivni okvir koji, na prvi pogled, daje ograničene mogućnosti za upotrebu sorti koje nijesu zvanično priznate. Međutim, u francuskim vinogradima postepeno dolazi do realizacije brojnih projekata o istorijski zapuštenim sortama vinove loze, koji se oslanjaju na mreže konzervacionih rasadnika, koje su osnovali lokalni partneri francuske selekcije, i na individualne pristupe vinogradara. Taj trend prati dinamičan rad na istraživanju i konzervaciji, koji često nudi otkrivanje rijetkih ili genetski nepoznatih sorti u starim vinogradima. Konačno, biljni materijal iz kolekcije, čiji se sanitarni status često provjerava, daje uzgajivačima mogućnost gajenja biljaka bez ozbiljnih patogena i čija je identifikacija potvrđena.

Ključne riječi: autohtone sorte, diverzitet, adaptacije, genetske kolekcije, sortiment