

Coordinator: Alberto Vecesi  
English translation by Sonia Pasquale and Anne Freckleton.

## PINOT NOIR: GENERAL CHARACTERISTICS OF THE GRAPE VARIETY AND ITS NATIONAL AND INTERNATIONAL DIFFUSION

MARIO FREGONI, ALBERTO VERCESI

Cattedra di Viticoltura

Università Cattolica del Sacro Cuore, Piacenza

### SOME HISTORICAL FACTS ABOUT PINOT NOIR

The Pinots, with almost round leaves and predisposition to mutation, are similar to those almost wild vines used by our ancestors. Catone the Censor (second century BC) talked about *Hlveolum vinum*, and Lucio Giunio Moderato Columella, in what is considered one of the most important ampelographic classification of Roman times (*De re rustica*, first century AD), describes the *Helveolae* variety, characterized by light-isabella colored skin (Pinot Gris) or by frequent differences in their color, fertile even in poor soils. These characteristics identify these ancient varieties as the probable origin of the modern Pinots (Pinot Grigio, Bianco, and Verde, considered to be derived from the Pinot Noir) (DALMASSO, 1931; CALZECCHI, 1948; FREGONI, 1988; VERCESI, 1990).

The Pinots or their progenitors were already being cultivated before they were introduced into the Burgundy region of France by the Romans, even though it is there that they reached world-wide fame (GALTIER, 1951). The first references to Pinot (Pynos, Pinoz) are to be found in a document dated 1394 (VIALA *et al.*, 1901). Some interesting documents from between 1500 and 1800 talk about vines with similar characteristics to the Pinots being cultivated on the hills around Piacenza and Pavia (Pineolo, Pignolo gentile, Pignolo grappolato) (BRAMIERI, 1793; VECCHIA, 1967).

The Pinot Noir that we know today in Italy is the result of selection processes developed by the French. These were adopted many centuries ago in the area of the North-West Italian Appennines in the provinces of Piacenza, Parma and Alessandria, but only reached an appreciable diffusion in the mid-nineteenth century. Thanks to, first of all, the initiatives of some individual producers of sparkling wines *méthode traditionnelle*, and later of qualified wine growers' associations, in the first decades of the twentieth century Pinot Noir became widely established in the Oltrepò Pavese. Here, in time, producers of quality sparkling wines *méthode traditionnelle* from Piedmont, Lombardy and Trentino Alto Adige obtained their supplies.

The cultivation of Pinot Noir for the production of sparkling wines *méthode traditionnelle* generated an increasing interest from both within and outside the Oltrepò Pavese and led to its greater popularity.

Today, the Oltrepò Pavese is one of the most important wine growing areas in Europe and indeed in the world for the production of quality sparkling wines *méthode traditionnelle* and is the biggest Italian source of Pinot Noir.

### MAIN CHARACTERISTICS OF THE GRAPE VARIETY

The leaves are of medium size, circular, dark-green on the upper side, thick, with strong blistering and three or five lobes according to the clone. Selection processes carried out in Burgundy have shown that the clones with higher leaf sinuses had small grapes, while the clones with shorted sinuses leaves gave a high yield with big grape clusters. The petiole sinus is narrow - lyrate or with funnel-shaped leaves with overlapping of petiole sinus; the leaf teeth are with both sides convex and medium-sized. The lower side of the blade is slightly arachnoid. The grape clusters are small, 7-10 cm long, cylindrical, rarely winged, compact and with a very hard woody peduncle. The berries are small, round or slightly oval, blue-black or dark purple in color, covered with abundant pruinescence. The skin of the berry is rich of color, the pulp it

is abundant and juicy, but not colored. The grape ripens later in the second period. The Pinot Noir bud-break is precocious and this makes it particularly susceptible to late spring frosts, particularly when grown on the plain or on the valley floor. Cold and damp conditions while flowering result in abundant colouring (GALET, 1985).

In Pinot, the grapes grow at the proximal part of the arm. In fact, in Burgundy, the vine is cultivated as a Gobelet - training low with 3 or 4 spurs each with 2 shoots or a simple Guyot with a maximum load of 8 buds *per* vine. In Champagne, leaving aside the great *crus*, the training system used is a simple Guyot with the cane of 10 buds and a spur of 3 buds, or a double Guyot with two canes of 8 buds and 2 spurs of 2 buds.

The numerous selection processes undertaken in Burgundy and in Champagne resulted in production clones and a highly variable degree of alcohol (26-90 hl/ha with 8.8-11.7% alcohol content).

It should also be noticed that production is closely linked to that year's weather. The best Pinots are obtained in limestone and clay-limestone soils only in temperate climates. In southern regions, the grapes mature in August, the hottest month, and these provide wines that are highly alcoholic but do not have a specific bouquet. Some growers obtain excellent wines by planting the vines at higher altitudes. Pinot is sensitive to disease, above all to *Peronospora* (downy mildew), *Oidio* (powdery mildew) and *Botrytis cinerea* (common gray mold).

The most common rootstock used in Champagne are 41B (76%) and SO4 (11%); less common are 3309 (7%), 161-49 (3%) and K5BB (2%) (MONCOMBLE, 1990).

Pinot Noir creates highly valued wines, well known on the international stage such as Clos de Vougeot, Corton, Romanée-Conti, etc. These are all included in the Côte d'Or, besides providing the basis for Champagne (mixed with Chardonnay and Meunier grapes varieties).

Pinot Noir has many clones, characterized by different production capacity and different quality levels. Some clones, such as n. 398, 388, 389, are very productive, with usually medium-big grape cluster and are used in Champagne. While others, such as n. 111, 114, 292, 459, are better quality usually with smaller clusters; these are cultivated in Burgundy to produce red wines for long-term maturation (GALET, 1985). Clone 115 is another high-quality clone with small grapes and berries. The most appreciated clones for their organoleptic characteristics are those with medium-small clusters and small berries, because the most important elements are concentrated in particular in the skin; the skin/pulp ratio of these clones promotes quality. The clones with big grapes, such as the Swiss Wandenswill, produce more but are of lower quality. In fact, they do not satisfy the criteria for Trentino DOC (FREGONI, 1985).

#### GRAPE VARIETIES IN ITALY AND THE WORLD: THE ROLE OF PINOT NOIR

Of the various factors that make up the viticultural agrosystem in all its complexity (terrain, climate, grape variety, rootstock, cultivation techniques used), the grape variety used is the most important factor in determining product quality. This is not only in relation to the direct and experimental experiences available, but also for strategic reasons in so far as it is not a natural process but can be selected by the grower and, therefore, is more than ever a tool in his or her hands. Complete statistics are not available concerning the worldwide diffusion of the principal grape varieties for wine growing. But on the basis of reports in the literature we can identify 18 principal grape varieties (TABLE 1).

TABLE 1. Estimate of the most common grape varieties for winegrowing in the world with indication of surface areas used and the countries where these varieties are found most according to data from ROBINSON (1986), modified by DRY *et al.* (1988), BOURSIQUOT (1990), and the 3<sup>rd</sup> General Agricultural Census (1982).

(b)= white grape

() probable current figures.

(1) includes Moscato Gordo Blanco, Fortignan;

(2) Catarratto Bianco Comune and Catarratto Bianco Lucido

VARIETY	SURFACE AREA (ha * 1000)	COUNTRIES OF GREATEST DIFFUSION
Airen (b)	476	Spain
Grenache	331	Spain, France, Italy
Rkazieteli (b)	267	ex USSR
Trebbiano (b)	200	France, Italy
Carignan	170	France
Pais/Mission/Criolla	145	Argentina, Chile
Cabernet Sauvignon	135	Chile, France, ex USSR
Moscato (b) (1)	130	Argentina, Spain, ex USSR
Monastrell	113	Spain
Merlot	100	France, Italy
Sangiovese	100 (80)	Italy
Bobal	95	Spain
Catarratto (b) (2)	82	Italy
Semillon (b)	75	Chile, France
Barbera	70 (70)	Italy
Riesling (b)	66	ex USSR, Germany, Italy
Welschriesling (b)	64	ex Yugoslavia, Hungary
Macabeo (b)	58	Spain

The two most widely grown varieties among all areas examined dominate in Spain. In fact, Spain has the most vineyards in the world (just under 1.5 million ha) followed by Italy and France with just under 1 million ha. However, as far as grape production is concerned, Spain (6,300 million kg in 1990) produces less than Italy and France (2,000 and 1,700 million kg, respectively) (1990 data, OIV). The Soviet Rkazieteli is to be found on a small area followed by Trebbiano. Cabernet Sauvignon is in seventh place and the South American Criolla is next with less than 145,000 ha. The three varieties found almost exclusively in Italy occupy the eleventh and fifteenth places: Sangiovese (100,00 ha in central-southern Italy), Catarratto (82,000 ha in eastern Sicily) and Barbera (70,000 ha mostly in north-western Italy). Riesling covers 66,000 ha considering the areas in the ex-Soviet Union. It is thought that worldwide Chardonnay and Pinot Noir cover 50,000 and 37,000 ha, respectively (BOUBALS, 1990).

A look at worldwide figures from the 3<sup>rd</sup> Agricultural Census (1982) shows, from a quantity-quality point of view, the principal characteristics of the wine grape varieties to be found in Italy (TABLE 2).

Table 2. Surface area used for the 20 most common wine grapes in Italy (3<sup>rd</sup> Agricultural Census, 1982). Some of these are really groups of similar wine grapes (see notes).

VARIETY	SURFACE AREA (ha)	NOTES
Sangiovese	100,541	(1) Trebbiano toscano (58%), T. romagnolo (26%), T. giallo, T. di Soave, T. modenese, T. verde di Velletri, T. spoletino.
Trebbiano (b) (1)	97,112	
Catarratto (b) (2)	81,470	
Barbera	62,757	(2) Catarratto bianco comune (75%), C. lucido (25%)
Merlot	48,176	(3) Malvasia bianca di Candia (34%), M. del Chianti (24%), M. bianca (20%), M. del Lazio (12%), M. di Basilicata, M. di Sardegna, M. istriana, M. di Lipari, M. di Casorzo, M. di Schierano, M. di Bolzano.
Malvasia (b) (3)	47,215	
Negroamaro	38,421	
Montepulciano	34,646	
Primitivo	31,693	
Lambrusco (4)	20,902	(4) Lambrusco salamino (28%), L. Maestri (24%), L. Marani (11%), L. a foglia frastagliata (13%), L. di Sorbara (10%), L. grasparossa (9%), L. viadanese, L. montericco.
Calabrese	19,685	
Nuragus	16,072	
Aglianico	15,011	
Cannonao	14,257	(5) Moscato bianco (93%), M. di Terracina, M. giallo, M. di Scanzo.
Ansonica	13,756	
Moscato (5)	13,498	
Nerello Mescalense	12,484	
Garganega	12,484	
Dolcetto	11,807	
Monica	10,479	
NATIONAL TOTAL (1982) 1,063,330 ha with 300 grape varieties		

As far as surface area is concerned, three varieties dominate: Sangiovese (100,000 ha), Trebbiano (100,000 ha) and Catarratto (81,000 ha). Catarratto Bianco Comune and Catarratto Bianco Lucido are the varieties with the greatest concentration in Italy; more than half the entire surface area dedicated to them is to be found just in the province of Trapani. Sangiovese is to be found above all in the provinces of Florence, Siena, Foggia, Ascoli Piceno and Bari. The area known for Trebbiani grapes includes Trebbiano Toscano (58%), Trebbiano Romagnolo (26%), Trebbiano d'Abruzzo (7%), Trebbiano Giallo, Trebbiano Soave, Trebbiano Modenese, Trebbiano Verde of Velletri, and Trebbiano Spoletino. This group of varieties, in particular the first three listed, is to be found above all in the provinces of Ravenna, Florence, Rome, Latina, and Agrigento. Barbera is widely cultivated but is most concentrated in the North-Western Appennines (the so-called Cispadana): provinces of Cuneo, Piacenza, Asti, Alessandria, Pavia. A little under 50,000 ha are used for cultivation of Merlot, that is the main vine-stock of red wines of Veneto and north-eastern Italy. It is mostly found in the provinces of Treviso, Padua, Venice and Pordenone. The eleven Malvasie wines that have been described and reported also cover less than 50,000 Ha. Muscats are much less widespread. In Italy, Muscats are almost

exclusively represented by Moscato Bianco (93%), that covers approximately 13,500 ha. Some of the most important vine-stocks in Apulia (Negroamaro, Primitivo, Montepulciano of central Italy) cover between 30,000 and 40,000 ha (TABLE 3).

TABLE 3. Areas of cultivation of the 8 principal varieties of wine grape grown in Italy. () rounded to a thousand Ha (3<sup>rd</sup> Agricultural Census, 1982).

VARIETY	PROVINCES OF GREATEST CULTIVATION
SANGIOVESE	Florence (14), Siena (9), Ascoli Piceno (6), Bari (4)
TREBBIANO (1)	Ravenna (17), Florence (6), Rome (5), Latina (4), Agrigento (3)
CATARRATTO (1)	Trapani (54), Palermo (12), Agrigento (12)
BARBERA	Asti (17), Alessandria (15), Pavia (6), Cuneo (4), Salerno (3)
MERLOT	Treviso (10), Padua (9), Venice (6), Pordenone (5)
MALVASIA (1)	Florence, Siena, Rome, Benevento, Caserta, Catanzaro
NEGROAMARO	Lecce (19), Brindisi (17), Taranto (2)
PRIMITIVO	Taranto (17), Bari (8), Brindisi (3), Lecce (1).

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(1) including groups of similar wine grapes. (see TABLE 2).

Others less widespread (covering around 20,000 ha) are Lambrusco: above all Lambrusco Salamino, Lambrusco Maestri, Lambrusco Marani and Garganega with around 12,500 ha. Garganega is typical for white wines in the Veneto region. Finally, we have Dolcetto with a little under 12,000 ha, the only wine stock of north-western Italy, after Barbera, to be cultivated over a significant area.

Other varieties and group of varieties not mentioned so far cover areas of less than 10,000 ha. These also include Pinot Noir and Chardonnay. Each of these varieties, the first of which is the subject of this paper, covers an estimated surface area of nearly 4,000-5,000 ha. Interestingly, even as recently as the beginning of the 1990s, these (and above all Chardonnay) were cultivated over very small areas (approx. 200 ha for Italy as a whole) (TABLE 4).

TABLE 4. Italian vineyards according to region (4<sup>th</sup> Agricultural Census, the first 199 results). Total surface area just under 920,000 Ha.

REGION	SURFACE AREA 1990 (ha)	VARIATION FROM 1982 (%)
Sicily	167,924	- 10.4
Apulia	137,546	- 25.8
Veneto	80,780	- 15.7
Tuscany	69,249	- 23.1
Emilia Romagna	66,419	- 22.4
Piedmont	62,542	- 16.1
Lazio	51,016	- 28.5
Sardinia	47,712	- 32.0
Abruzzo	40,513	- 0.6
Campania	39,668	18.9
Marche	26,242	- 18.1
Lombardy	25,520	- 16.2
Calabria	24,008	- 36.2
Friuli V. G.	19,717	- 8.7
Umbria	17,913	- 21.9
Trentino A. A.	13,434	- 3.1
Basilicata	13,013	- 30.9
Molise	7,836	- 14.9
Liguria	4,941	- 33.1
Val d'Aosta	688	- 27.3
<b>ITALY</b>	<b>TOTAL 916,909</b>	<b>- 19.9</b>

Data from the 4<sup>th</sup> Agricultural Census (October 1990) are still not available. However, the number of newly grafted vine cuttings for wine grapes in the period 1980 to 1990 shows that the areas dedicated to Chardonnay totaled between 7,000-8,000 ha, of which the biggest part (2,000-3,000 ha) is not yet productive or is characterized by 'young' production. Considering grape-growing on a national and worldwide level, Pinot Noir, from a quantitative point of view, does not have a significant role. Even in France, where this vine-stock has achieved greatest fame, it only covers approximately 22,000 ha (1988). This puts it in eleventh place as far as surface area is concerned, after Carignan (167,117 ha), Trebbiano (102,973 ha), Grenache (86,725 ha), merlot (60,000 ha), Cinsaut (48,183 ha), Cabernet Sauvignon (36,467 ha), Aramon (34,666 Ha), Gamay (33,620 ha), Cabernet Franc (30,256 ha) and Syrah (27,041 ha), followed by Chardonnay with approximately 20,000 Ha.

The surface area dedicated to Chardonnay is even less than that covered by hybrid direct producers (22,460 Ha) among which above all Baco 22, 12 375 SV, 7120 C and 18 315 SV. The extension of Pinot Noir cultivation still continues to grow, also in France: 8,535 ha in 1958, 11,876 ha in 1968, 17,270 ha in 1979, 21,971 ha in 1988.

A similar growth has been seen for Chardonnay: from 7,325 ha in 1958 to 19,869 ha in 1988. The area used for Pinot Noir in France is almost equally divided between the area of Champagne

(clones with medium-large clusters) for the production of sparkling wines and Burgundy (clones with small clusters) for red wines.

In Champagne, 40% of vineyards are used for Meunier while the rest is used for Pinot Noir and Chardonnay, with slightly more for the former. In Burgundy, red wines are produced using only appropriately matured Pinot Noir, above all in small casks (barrique), with very high standards of quality. It could be said that some of the wines that today are considered among the best in the world, both white and red, come from Pinot Noir.

In Italy the cultivation of Pinot Noir is known almost exclusively for the production of sparkling wines, also of very high quality. The main area of production is the Oltrepò Pavese, in Lombardy, and for by now almost a century grapes from this area have sustained the biggest part of production of quality Italian sparkling wines. This is why Pinot Noir of the Oltrepò Pavese, although it only makes up a small quantity of the grapes produced in what is the biggest wine producer in the world, Italy, is of particular importance from a qualitative point of view in the still economically healthy sector of the national and international market for sparkling wines (TABLE 5).

TABLE 5. Principal countries producing sparkling wines. Significant quantities of sparkling wines are also produced in Bulgaria, Hungary, Austria, Portugal, ex-Yugoslavia, Luxemburg, Greece, Tunis and Morocco.

COUNTRIES	Millions of bottles		
	1984		1989
FRANCE	338		406
GERMANY	267		338
EX USSR	-		270
SPAIN	113		150
USA	-		148
AUSTRALIA	-		63
	1980	1985	1989
ITALY	134	190	210

Figure 1. Millions of hl of wine produced, consumed and exported from Italy 1981-1988.

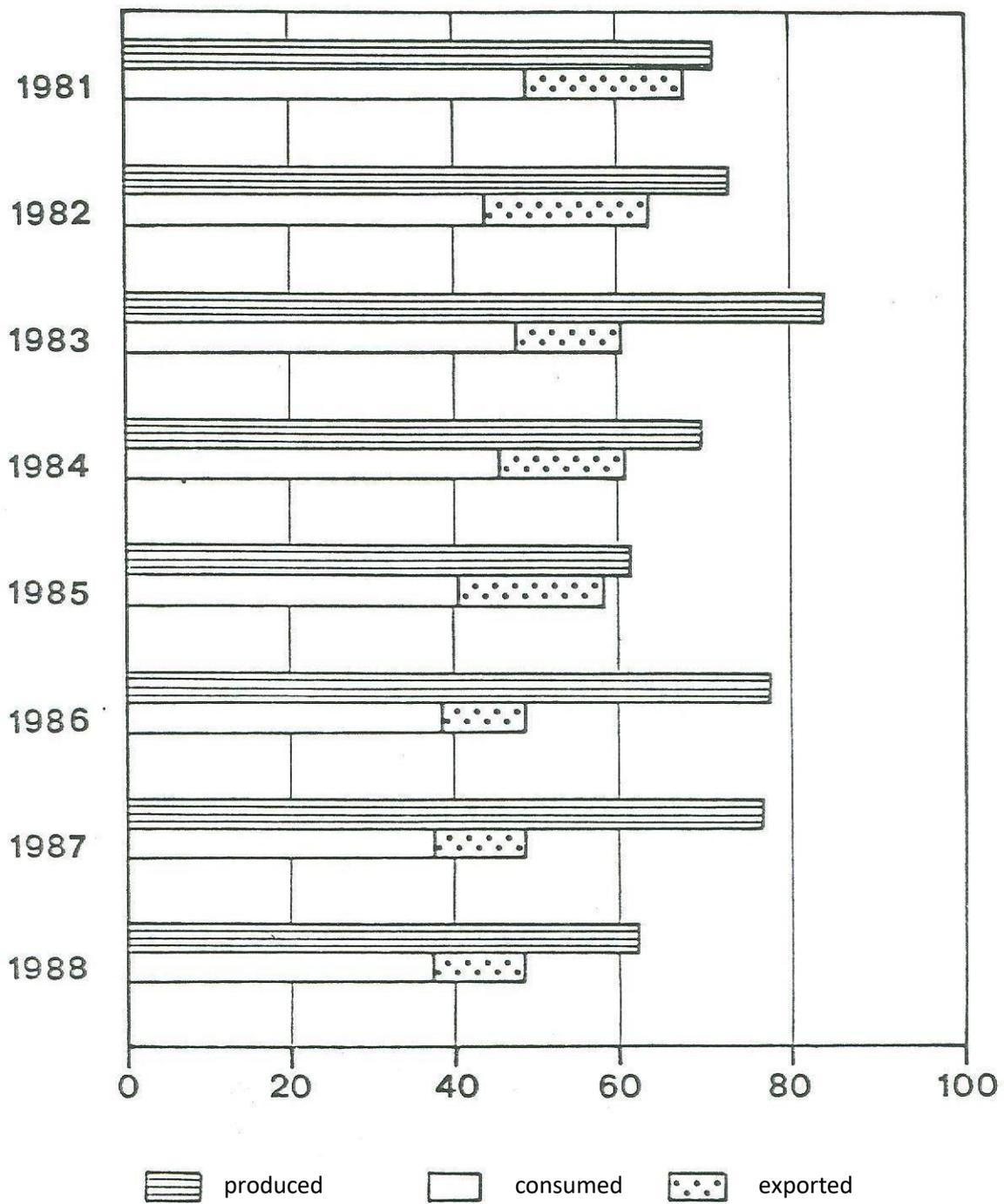
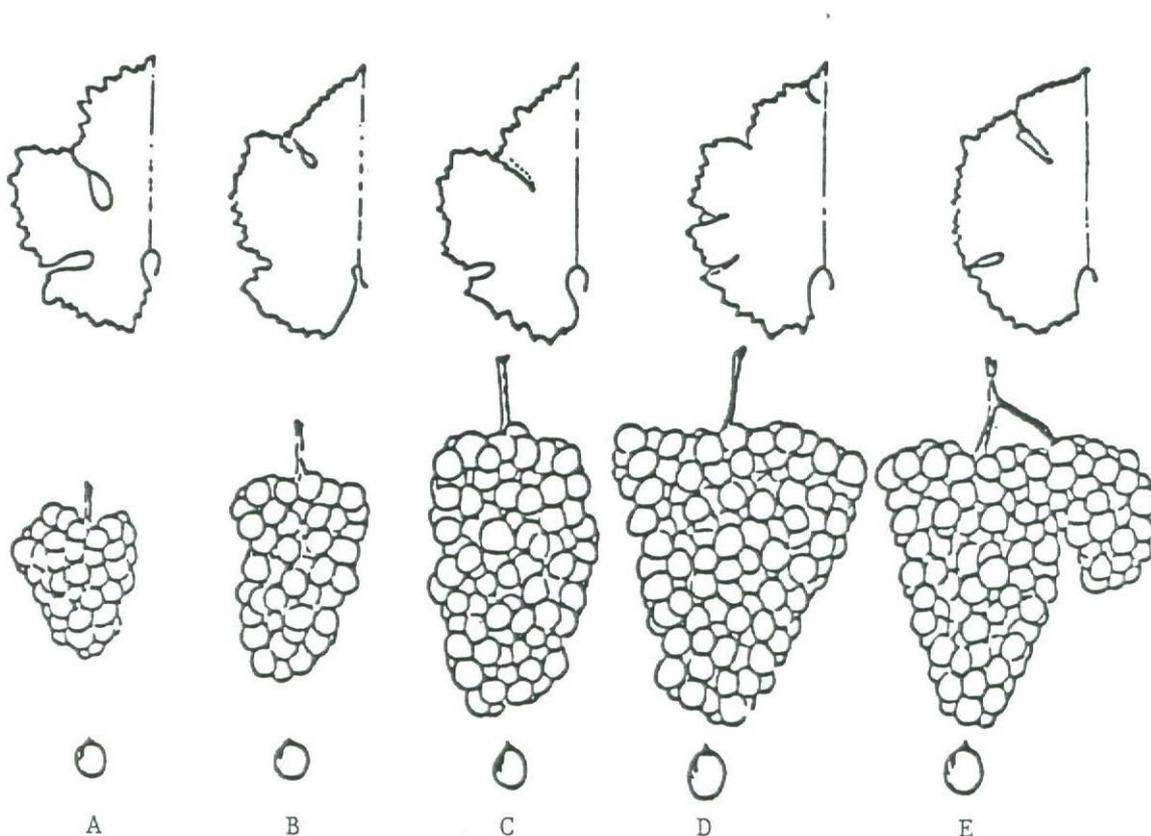


Figure 2. Average values of some characters of 5 types of Pinot Nero (fine A, fine B, intermediate C, productive D, productive E, grown in Valle Versa, 1983-1987) (modified from VALENTI, 1988).



	A	B	C	D	E
Average weight of grape (g)	80.0	99.9	106.9	122.9	136.5
Average weight of berry (g)	0.82	0.87	0.91	0.91	0.94
Sugar (%)	16.44	16.06	15.56	15.81	15.6
Titrateable acidity (‰)	8.56	9.47	9.26	8.53	8.7

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