Differentiating and grouping of oltrepo' pavese environments according to grape maturation

F. MASTROMAURO[1], A. LEONI[1], A. SCIENZA[2]

[1] *C.I.VI.FRU.CE. - Regione Lombardia - Torrazza Coste, Pavia , Italy.*
[2] *Istituto di Coltivazioni Arboree, Università degli Studi di Milano, Via Celoria, 2, Milano, Italy*

INTRODUCTION

The maturation patterns process has been very studied. In particular the modelization of the sugars and titratable acidity during the ripening period was an important approach, in particular for the prediction of harvest date (Barillere *et al.*, 1988 ; Jourion et Al.,1987 ; Maujean et Al., 1983 ; Scienza, 1989). In Oltrepò Pavese, the widest viticultural district of Lombardy - Northern Italy - (about 15000 hectares), grape maturation trends shows high variability, due to the large variation in environmental characteristics of vineyards (altitude, exposure, soil type, mesoclimate) and to "*cultivar x environment*" interaction.

In 1994 C.I.VI.FRU.CE. the agricultural experimental station of Lombardy Regional Government, started a programme to study the different type of grape maturation in Oltrepò Pavese.

MATERIAL AND METHODS

The main varieties grown in Oltrepò Pavese area were chosen : *Chardonnay (w), Cortese (w), Moscato (w), Riesling Italico (w), Barbera (b), Croatina (b) and Pinot Noir (b).* Sixty-five vineyards, homogeneus for what concerns training system, plant density and age, managed according to local commercial pratices, were chosen as representative of differnt environments.

For this communication results of two cultivar are reported the Table above.

Variety :	PINOT NOIR (b.),	CROATINA (b.)
Training sytem :	GUYOT	GUYOT
Vineyards :	N. 20	N. 22
Harvest :	1995	1995
Sampling : from veraison	weekly	weekly

Grape varieties *Pinot Noir* and *Croatina* were chosen for their different harvest date : early and late respectively. Air temperature and humidity from July (veraison) to vintage were recordered in 16 meteorological stations located in the area. The mean temperature was utilized for identify the **Alpha** and **Beta** zones (Jackson and Lombard, 1993). Musts analysis : Refractometrics solubles solides (RSS), Titratable Acidity (TA). To study the grape maturation process we have described with the parabola's equation : **$Y=ax+bx2+c$** the trends of Titratable Acidity and Sugars (Bertamini, 1992). Where : 'Y' = maturation parameter (RSS or TA) ; 'x' = n. of day from veraison. To interpret the equation the following meaning to the 'a', 'b' and 'c' coefficient were assumed : 'a' and 'c' = precocity, 'b' = rate of decrease for Titratable Acidity and accumulation for Sugars (RSS). Homogeneous groups were obteined with Cluster Analysis, executed on the coefficients of the equations after their standardization. SAS/STAT Statistical package was used to perform the statistical elaboration (Sas for P.C., Release 6.08).

RESULTS

Jackson and Lombard (1993) proposed to characterize the environment for viticultural aptitude as Alpha and Beta zones.

Alpha zone : The mean temperature at ripening time for a specific cultivar is 9°C to 16°C. In this zone if sufficient sugar accumulation is reached, the nights are still cool enough to ensure adequate color, appropriate pH and acidity levels, and good flavor and aroma compounds.

Beta zone : The mean temperature at ripening time 16°C and above. The days and nights are still warm, and attaining maturity is not a problem. Warm seasons offer no obvious advantage, and any treatment which hastens ripening may not necessarily considered an advantage.

Table 1. Groups of ambients according to Alpha and Beta zone. (*) With insufficient sugar accumulation.

VARIETY	ALPHA	BETA
Pinot Noir	BC1*, BP1, CM1, CM3, SM2, SM3	CA1, CI1, CM2, CO1, FI2, MC1, MC2, MP1, OG1, PG2, PG3, SM1, TV1, TO1
Croatina	BC1*, CA1*, CI1, CI2, CM1*, CM3, CP2*, CV1, FI2, OG1, RO1, RO2, RO3, SM1*, SM2, SM3.	CO1, CM2, MP1, TO1, TV1

Fig. 1 and fig. 2 shows two opposite behaviour, S.Maria della Versa (SM2) was an Alpha zone for both variety, while Torrazza Coste (TO1) was a Beta zone. Tab. 2 shows homogeneus groups of the studied environments according to Alpha and Beta classification for the two variety harvested 1995 : *Croatina* (the late grapes) was the variety that had the ripening in the Alpha condition in the most part of Oltrepò Pavese ; *Pinot noir* instead only in a few zones is in Alpha conditions. 1995 year was characterized by bad weather (rain and low temperature) from the last week of september, for this reason not always was reached a sufficient sugar content.

Cluster Analysis

The Cluster Analysis was executed on the three coefficients('a', 'b', 'c') of two equations of RSS and TA with the following results. **Pinot Noir** (fig. 3) : Group 4 had a rapid maturation with the earliest ripening phase, it is known as a warm environment ; Groups 3 and 5 had a good maturation : the were different only for the faster decrease of TA of N.3., this two groups are characterized as medium warm to warm temperature ; Groups 2 and 1 had a slow maturation with a slow decrease of TA : the two environments were different for the faster increment of the RSS of N.1 ; this are the colder environments of Oltrepò. **Croatina** (fig. 4) : Environments 2, 3 and 1 had a good maturation, group N.1 (Central Oltrepò) was different for the faster decrease of TA ; Group N.3 (Eastern Oltrepò and typical production zone of *Croatina*) was different for the faster accumulation of sugars ; Environments N.4 and N.5 (Western Oltrepò) had trends of maturation contrastant, slower but with an early start in Environment N.5 and faster with a delay start in Environment N.4.

CONCLUSION

The Alpha and Beta zone classification was a good descriptor for the environment characteristics, especially for the late varieties in Oltrepò Pavese. The grouping based on the trends of Sugars and Titratable Acidity was interesting and was able to highlight the environmental influence on the grape maturation, that is different for different variety.

However it is necessary to verify for other years this results : in fact the influence of the climatic conditions was very important for grape maturation process.

The aim of C.I.VI.FRU.CE.'s project is also to give a service by a weekly bullettin reporting the most important musts characteristics during grape maturation. This approach will be also useful to add information to the assessment of viticultural aptitudes of Oltrepò Pavese, based on the study of performances of grapevine in different subzones homogeneus as concern landscape forms, litological and pedological descriptors (Scienza *et al.*, 1990).

REFERENCES

BARILLERE J.M., TRUBERT M., CAILLET A. - 1988 - Courbes de maturitè et date de vendanges. *Progres Agr. Vitic., 105, 18 : 411-415*

BERTAMINI M. - 1992 - Caratterizzazione bioclimatica, studio della maturazione dell'uva e vocazionalità enologica delle sottozone della D.O.C. Bardolino. *Proc. : "Il Bardolino verso la D.O.G.C." 8/11/1992 - Bardolino.*

JACKSON D.I., LOMBARD B. -1993 - Environmental and management practices affecting grape composition and wine quality - A Review. *Am. J. Enol. Vitic., 44, 4 : 409-430.*

JOURION F. ASSELIN C., MORLAT R. - 1987 - Cinétique d'évolution des principaux composants de la baie pendant la maturation du cépage Cabernet franc issu de divers milieux viticoles de la moyenne Vallée de la Loire. *Proc. : "III Simp. Int. sur la Physiologie de la Vigne" Bordeaux, 24-27/6/1987.*

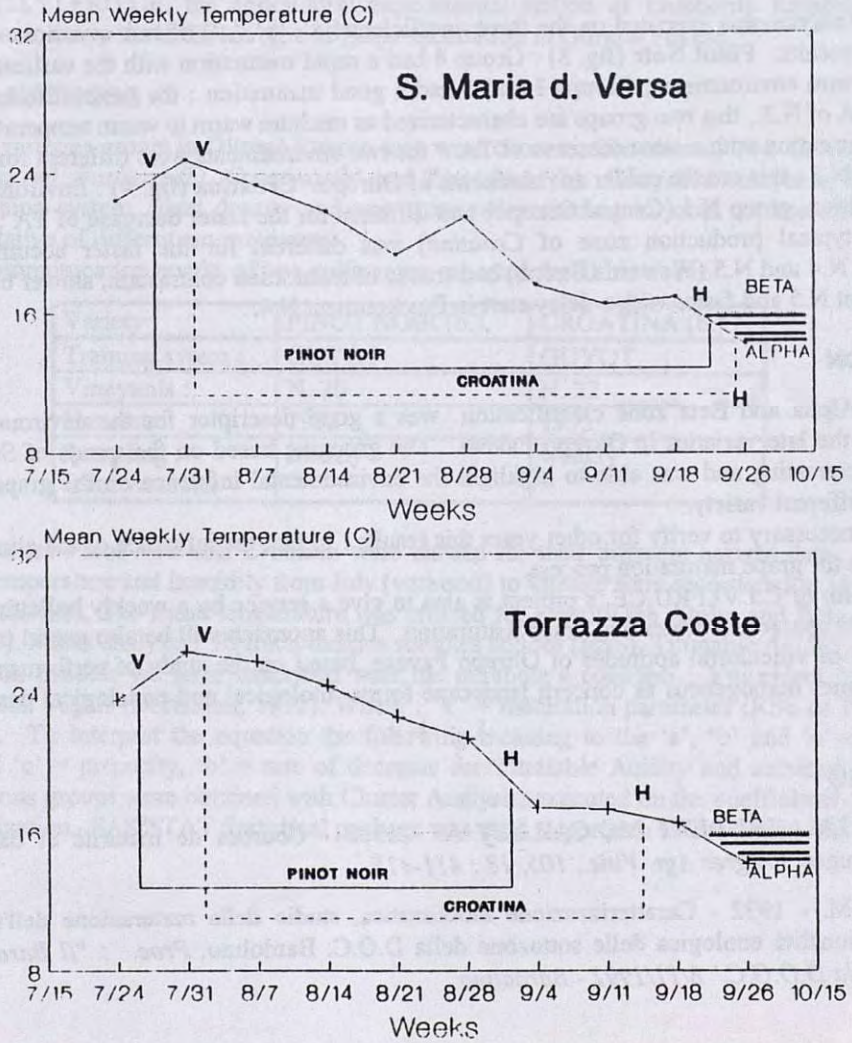
MAUJEAN A., BRUN O., VESSELLE G., BUREAU G., BOUCHER J.M., COUSIN M., FEUILLAT M., -1983 - Etude de la maturation de cépages champenois. Modèles de prevision de la date de vendange. *Vitis, 22 : 137-150.*

SCIENZA A., BERTAMINI M., FAILLA O., IACONO F., ROMANO F.A., STEFANI R. - 1989 - Utilizzo dei dati climatici e delle cinetiche di maturazione nelle definizioni di modelli previsionali della vendemmia. Proc. :"Agrometeorologia, Agricoltura e Ambiente", *Accademia dei Georgofili, Ce.S.I.A., CNR, Firenze 21-23/9/1989, 707-721.*

SCIENZA A., BOGONI M., VALENTI L., BRANCADORO L., ROMANO F.A. - 1990 -la conoscenza dei rapporti tra vitigno ed ambiente quale strumento programmatorio in viticoltura : stima della vocazionalità viticola dell'Oltrepò Pavese. *Vignevini, XVII, N.12 Supplemento.*

WINKLER A.J., COOK J.A., KLIEWER W.M. and LIDER L.A. - 1974 - *General viticulture.* University of California Press, Berkele.

Fig.1:Grape maturation for the two varieties in relationship to Alpha and Beta zones in: S.Maria della Versa (Eastern Oltrepò), Torrazza Coste (Western Oltrepò)



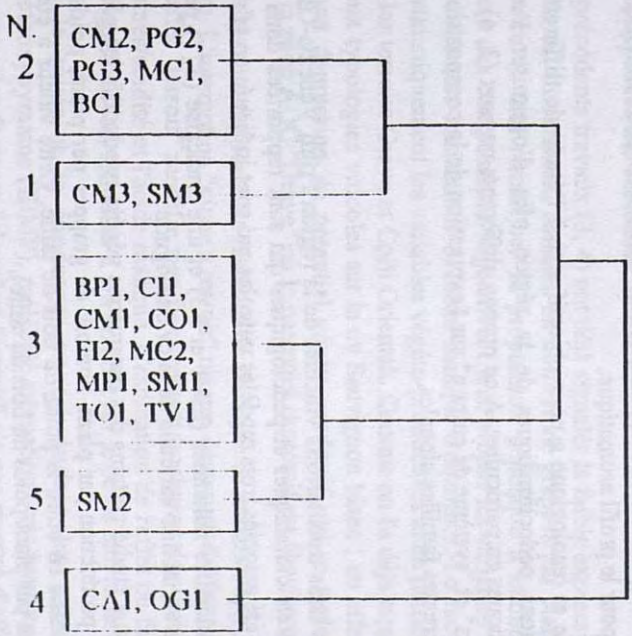


Fig. 3: Classification of the ambient with the coefficient of the simulation model for Pinot noir maturation.

Cluster	Decr.Tit.Act.	Acc.S.S.R.	Earl.-Rip.
N. 1	Slow	Fast	Mean
N. 2	Slow	Slow	Mean
N. 3	Fast	Mean	Low
N. 4	Fast	Fast	High
N. 5	Mean	Mean	Low

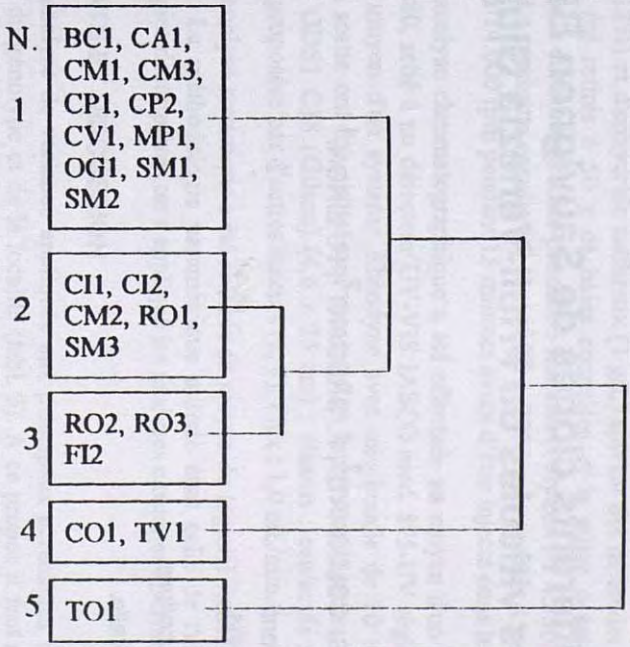


Fig. 4: Classification of the ambient with the coefficient of the simulation model for Croatina maturation.

Cluster	Decr.Tit.Act.	Acc.S.S.R.	Earl.-Rip.
N. 1	Fast	Mean	Mean
N. 2	Mean	Mean	Mean
N. 3	Mean	Fast	Mean
N. 4	Fast	Fast	Low
N. 5	Slow	Slow	High