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## TRACEABILITY OF WINE - A CRITERION OF QUALITY AND FOOD SAFETY FOR THE CONSUMER

Ecaterina Covaci, Tatiana Capcanari, Alexandra Lesanu

Technical University of Moldova, Faculty of Food Technology,  
9/9 Studentilor Street, MD 2045, Chisinau, Republic of Moldova

\*Corresponding author: Tatiana Capcanari, e-mail: [tatiana.capcanari@toap.utm.md](mailto:tatiana.capcanari@toap.utm.md)

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**Abstract.** In the last decade, several factors have determined an increasing demand for wine supply chain transparency. Indeed, amalgamation, fraud, counterfeiting, use of hazardous treatment products and pollution affect the trust of consumers, who are more and more oriented to consider the so-called “*credence attributes*” rather than price. Thus, consumers demand detailed information on the overall process from the grape to the bottle. In this chapter, we present a system for traceability in the wine supply chain. The system is able to systematically store information about products and processes throughout the entire supply chain, from grape growers to retailers. Also, the system manages quality information, thus enabling an effective analysis of the supply chain processes. Effective wine traceability is based upon the accuracy of the information about the products contained in records held by the various supply chain partners.

**Keywords:** *procedures, production, Rară Neagră grapes, standardization, Supply Chain Model.*

### Introduction

It is an important principle in ensuring food safety that products can be traced back to source, all along the supply chain [1]. All operators in the chain (from wine grape grower, to wine producer, to supplier of substances intended to be incorporated into wine, to distributor, to exporter, to retailer) must be able to identify any person or business from whom they have been supplied with wine or any substance intended to be incorporated into wine (one step back); and to whom they have supplied wine or any substance intended to be incorporated into wine (one step forward) [2].

Everyone must also have accurate records of each step in the process. The Wine of Origin system traces the bottle of wine all the way back to the vineyard and the new seal links the vineyard to the growing practices in that vineyard. This is a highly sophisticated degree of traceability, which is being universally applied across the wine industry [3].

The most internationally recognized definition of traceability defines it as the “ability to trace the history, application or location of an entity by means of recorded identifications” (ISO 8402) [4, 5].

There are however other definitions, such as the one contained in the General Food Law - Council Regulation (EC) No. 178/2002 [3] and the one established by the Codex Alimentarius Commission [7]. If properly used by each member of an extended supply chain, products and data, including information required to manage traceability and shelf life, can be exchanged through each link in the chain - facilitating the seamless flow of information with the flow of goods [8]. Traceability Tools can improve the efficiency of recording and exchanging information between supply chain participants. When used in conjunction with databases containing accurate and timely records, standards provide all supply chain participants with the technical capability to see the origin of a product, both in their own locations and across the entire supply chain [9].

At the simplest level, item numbering is what the name suggests – a system for identifying items by giving each one a unique number (e.g. a bottle will have a different number to a case). Numbering can be applied at every stage of production and distribution. It is used to identify products and services [9, 10]. Global Location Number is a numeric code that identifies any legal (e.g. company, division), functional (e.g. accounts dept) or physical entity (e.g. plot of land) within a business or organization. Each location is allocated a unique number.

Global Trade Item Number is a number used for the unique identification of trade items worldwide. A trade item is any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced, ordered or invoiced for trade between participants at any point in any supply chain [10, 11].

Serial Shipping Container is a number, which is used for the unique identification of logistic units. A logistic unit is an item of any composition established for transport and/or storage, which needs to be managed throughout the supply chain. It provides an unambiguous identification for logistic units. All parties in the supply chain can use it as a reference number to the relevant information held in electronic or human readable files.

Application Identifier Attribute information is any variable information required over and above the trade unit or logistics unit identification, such as a batch number, production date or customer purchase order [12, 13].

Bar Codes allow automatic data capture, which is a key business solution in an efficient supply chain [14]. The numbering and bar coding system allows fast accurate and timely data input into computer systems, automating the flow of information into business processes. It also enables improved data capture and transfer of information, while reducing costs [15, 16].

### **The Wine Supply Chain Model of Rară Neagră grapes**

According to current preferences and world wines consumption trends of autochthonous grapes, in the paper is a studied Rară Neagră autochthonous grape.

Rară Neagră grapes produce a red wine with flavors and aromas of black cherry, berries, plum, chocolate, and some herbs. Rară Neagră wine is popular with people trying to get accustomed to drier, more complex red wines because of its other characteristics, like low tannins which make it easier to drink than other reds wines.

The softer characteristics of Rară Neagră with the fruity flavors make it a red wine that is well-suited to lighter foods that will not overwhelm the flavors of the wine. More experienced wine drinkers sometimes see these characteristics as disadvantages and prefer Rară Neagră when mixed with other, more complex red grape varieties - especially those

that are harsher alone and can benefit from softening. Nevertheless, it is possible to create complex, interesting wines from Rară Neagră grapes.

In Moldova Rară Neagră is a late-ripening variety that gives red wines which are typically rich in acid and may exhibit a pronounced fruity character, the Rară Neagră grapes specification are included in Table 1. It is responsible for the fame of the Purcari wines in the 18 th century, before Cabernet Sauvignon was introduced in Moldova. This variety is used as a main blend component in the Purcari wine, Negru de Purcari.

Rară Neagră tends to make pale, light-bodied, fruity red wines with notable acidity and a characteristic sour cherry note. The pink-berried color mutation tends to produce mineral white wines with lime notes that persist on the finish.

The wine supply chain has always been complex and fragmented and with more distant suppliers and ever-more demanding customers, the unique characteristics of this supply chain bring challenges to implementing an effective traceability system. The largest companies account for a significant percentage of the industry and have significant technology requirements. The remainder of the industry is comprised of small to medium enterprises, many of which have found niches in specialty products and branding.

Table 1.

**Rară Neagră grapes specification.**

<b>Indicator</b>	<b>Characteristic</b>
<b>Description</b>	
Group	Wine variety
Sinonim	Papa neagră, Băbească neagră
Maturing	Late maturing
Frost	Low
Damage degree	Resistant to filoxera, a bit of mold
<b>Berry</b>	
Size	Average
Formular	Flattened form, seldom rounded
Peel	Average density
Flesh	Juicy
Color	Blue
<b>Bush</b>	
The type of growth	Strong
Leave	Average size, rounded
Flower	Bisexual
<b>Agriculture features</b>	
The period from the bud burst to full maturity	145 days
<b>Clusters</b>	
Size	Medium
Formular	Conical form
Productivity	Yield 8-10 t·ha <sup>-1</sup>

There is also a myriad of other support companies that provide materials, transportation, storage and other services that are also impacted by traceability. Companies vary greatly in their technical capabilities; from phone, fax and paper based transactions, through robust e-commerce, bar code, and other internal systems. Their ability to identify implicated product, and perform track and trace activities is directly related to their technical capabilities. The Working Group determined that the wine supply chain could be broken down into the following key areas: o Grape Grower o Wine Producer o Bulk Distributor o Transit Cellar o Filler / Packer o Finished Goods Distributor o Retailer Each area was examined with a view to explaining traceability within that business process, and to determine the relevant GS1 standards to be deployed.

Rară Neagră is cultivated in the south of Moldova in the regions of Dobruja, making it the second most widely planted grape variety in Moldova. It is also found in Ukraine, Romania and New York, United States, where the grape is known as Sereksiya Charni.

Being an old grape variety, Rară Neagră has demonstrated significant clonal variations including Copceac – a variation with bigger berries, Coada Rândunicii (Swallowtail) - a variation with a bisected bunch and Coada Vulpiei (Foxytail) - a variation that has a cylindrical prolongation of the bunch. It has also produced over the years two color mutations including a pink-berried mutation and a white-berried mutation known.

Ampelographers proved that Rară Neagră is a very old variety with the earliest mentioning of the grape dating back to the early 14 th century. Rară Neagră is a late-ripening grape variety that is also a mid to late budding vine which contributes to the grapes winter hardiness and resistance to the viticultural hazards of early spring frost. During the cold Eastern European winters, Rară Neagră is able to withstand temperatures as low as  $-18\text{ }^{\circ}\text{C}$  ( $0\text{ }^{\circ}\text{F}$ ). However the very loose, medium-sized bunches of thin-skinned berries are very susceptible to the hazards of botrytis bunch rot, downy and powdery mildew as well as drought during the growing season. If yields are not kept in check by winter pruning and green harvesting, the vine can be very vigorous and prone to developing millerandage.

### **Conclusions**

Today, food safety, guarantees of authenticity and origin and the range of healthy agro-food products on offer are three of the main consumer concerns in the vitivincultural sector. For these reasons, traceability has become a useful and necessary tool for safeguarding the proper functioning and knowledge of the process of production, development and marketing of wine, grapes and all other products of vitivincultural origin.

The objective of Wine Supply Chain Model of Rară Neagră grapes was to create a suitable environment in which to disseminate and discuss the current situation with regard to the global context of the traceability of grapevines and wine, with the vitivincultural sector. In this paper, different aspects were addressed – such as the need to guarantee the authenticity and origin (from the start to the end of the process of production, development and marketing), both from a standardization and market perspective, as well as from a technical and scientific one – through contributions making it possible to understand and identify the most appropriate procedures and methods for controlling traceability.

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### References

1. Jancis, Robinson and Julia Harding *The Oxford Companion to Wine*. Fourth Edition. Oxford University Press, 2015, pp. 105-112.
2. Bechini, A., Cimino, M.G.C.A., Marcelloni, F., Tomasi, A.: Patterns and technologies for enabling supply chain traceability through collaborative e-business. *Information and Software Technology*, 2008, 50 (4), pp. 342-359.
3. Bertolini, M., Bevilacqua, M., Massini, R.: FMECA approach to product traceability in the food industry. *Food Control*, 2006, 17 (2), pp. 137-145.
4. ISO, *ISO 8402:1994*, Quality management and quality assurance.
5. ISO, *ISO 9001:2000* and *ISO 9001:2008*, Quality management systems - Requirements, 2008.
6. EC General Food Law Regulation 178/2002: *Guidance Notes on the Food Safety*, 2004.
7. *Codex Alimentarius Commission*, 2010. Procedural manual, nineteen edition. Assured by the Secretariat of the Joint FAO/WHO Food Standards Programme, FAO, Rome.
8. Bevilacqua, M., Ciarapica, F.E., Giacchetta, G.: Business process reengineering of a supply chain and a traceability system: A case study. *Journal of Food Eng.*, 2009, 93 (1), pp. 13-22.
9. Broadbent, M. *Michael Broadbent's Vintage Wine*. Websters Int. Publishers, London, 2003, pp. 86-95.
10. Donnelly, K.A.-M., Karlsen, K.M., Olsen, P.: The importance of transformations for traceability - A case study of lamb and lamb products. *Meat Science*, 2009, 83, pp. 68-73.
11. *European Federation of Wine and Spirit Importers and Distributors (EFWSID)*, 2001. Voluntary Code of Practice for Traceability in the Wine Sector.
12. Gandino, F., Montrucchio, B., Rebaudengo, M., Sanchez, E.R.: On improving automation by integrating RFID in the Traceability Management of the Agri-Food Sector. *IEEE Transactions on Industrial Electronics*, 2009, 56, pp. 2357-2365.
13. Jansen-Vullers, M.H., van Dorp, C.A., Beulens, A.J.M.: Managing traceability information in manufacture. *Int. Journal of Information Management*, 2003, 23 (5), pp. 395-413.
14. Mouseavi, A., Sarhadi, A., Lenk, A., Fawcett, S.: Tracking and traceability in the meat processing industry: a solution. *British Food Journal*, 2002, 104 (1), pp. 7-19.
15. Opara, L.U.: Traceability in agriculture and food supply chain: A review of basic concepts, technological implications, and future prospects. *Journal of Food, Agriculture and Environment*, 2003, 1 (1), pp. 101-106.
16. Food Standards Agency of Actored Kingdom, Traceability in the Food Chain - A preliminary study, 2002.