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How information technology can support regulations and best practices for the management of health status of grapevine and product safety

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The need for knowledge about the origins and qualitative characteristics of food products or plants that are commercialized worldwide has increased due to consumer demands. This fact is due in part to recent negative events related to food production and has, in turn, led to stricter regulations to safeguard public health and ecosystems from the spread of pathogens. In an essential step to guarantee quality, beginning in the 1960s the former European Economic Community was involved in defining legal regulations regarding the health status of grapes and their production (68/93/EEC). The regulation of grapevine identity, health and production continued to develop until the last decade in Europe (2005/43/CE) and Italy (DM 13/12/2011), revealing its importance over the past 50 years. Regulations have followed the general trends in agriculture during the past century: not only with regard to new farming approaches and consequential environmental impact, but also the globalized trade of products which poses new challenges to import/export regulations. Food safety, market protection, property rights and ecological conservation are common themes of "global" consumers and governmental agencies. These concepts have been reinforced by the EU through ''The European White Paper on Food Safety".

Nowadays, many foods and agricultural products have to carry identifying labels or documents, as required by legal regulations (e.g. 2000/13/EC), to establish a safe traceability system. In the EU, grapevines in the certified category must be in line with the most recent directive (2005/43/CE), and associated labels have to report essential data such as the nursery where they were produced. Plant traceability, as in foods, can be supported by Information Technology (IT) and can be considered a best practice in agriculture, as is the case for livestock. The IT revolution, exemplified by the Internet, has made traceability and monitoring economically feasible and enabled traceability of food products through the labyrinth of the agricultural product supply chain. With regards to food plants, the implementation of IT solutions to trace the plant-to-food chain seems to be possible only in fruit trees, including grapevine, due to the difficulties in labeling and/or tracking herbaceous plants. The wine production line is characterized by many - effective or potential - IT innovations as technology has been able to permeate nearly every production step. With regard to the first step (i.e. selection and registration of a grapevine clone), an online database gives breeders, researchers and stakeholders an easy and lasting consulting system to share information regarding available clones. Several databases are available in Europe, such as the Italian "Catalogo Istituzionale del Registro Nazionale delle Varietà di Vite" or "Italian Vitis Data Base", the French "Base de données du Réseau Français des Conservatoires de Vignes", the German "The European Vitis Database" or "Vitis International Variety Catalogue". As for specific aims, some of these databases are more genetic-oriented than exhaustive digital archives, while others monitor production phases of premultiplication material. In any case, if the knowledge about varieties and clones is well supported by IT, the situation changes on farms or in vineyards where few IT solutions are available for health and quality management as most of them are in the prototype phase. In contrast to the situation with livestock, where technology plays an important role with electronically labeled and checked animals, farms generally have a low level of computerization, due to both the costs involved and the lack of urgency to shift to a more in-depth traceability system (Luvisi *et al*., 2012). However, available technology can satisfy various needs.

Radio-frequency identification (RFID) microchips can represent a safe tool to identify plants and foods that are protected by rights or subjected to specific regulations. The initial tests in grapevine by the Associazione Toscana Costitutori Viticoli (TOS.CO.VIT.) were carried out in 2006 on clones and involved the use of microchips implanted within the pith of rootstock (Bandinelli *et al*., 2009). This technology, if appropriately supported by information management systems, can support health controls and be a useful tool for managing risks related to environmental impacts of production systems, chemical residues and the worldwide spread of plant pathogens. In certified plant propagation and breeding programs, risk management may be a sufficient reason to change to RFID systems. Similar technology can be implemented in order to tracking the application of agrochemicals (Peets *et al*., 2009), the virtualization of vineyards by combining GPS technology (Luvisi *et al*., 2011), and the management of widespread monitoring stations using mobile devices

(Cunha *et al*., 2010). Finally, collaborative Web 2.0-based workspaces can be used to support sampling for health checks and the exchange of information between users and laboratories (Luvisi *et al*., 2012). IT can also offer real options for wine cellar management and bottling. Electronic labeling of wine for high value products using RFID systems and for the fight against forgery are principal areas for application, but do not involve cross reference to information about plant health or identity or the previously mentioned databases.

In conclusion, even if IT solutions can support management procedures with regard to the spread of pathogens in plant material and fight forgery, much still has to be done in order to create a virtual environment for grape and wine production, changing this fragmented agricultural "internet of things" into a coherent "internet of trees", in which regulations and best practices may converge in harmonized electronic labeling and databases, without losing the link between plants and food. Indeed, the relationship between plants and food is not just a simple question of input/output, but rather a complex system in which plant pathogens and their control play an important role. This link is promoted by the European Food Safety Authority (EFSA), the agency that provides scientific advice and communication on existing and emerging risks associated with the food chain and the Authority's work covers all matters with a direct or indirect impact on food safety, including plant protection and plant health as included in the general objective and mission of the EFSA.

References

BANDINELLI R., TRIOLO E., LUVISI A., PAGANO M., GINI B., RINALDELLI E., 2009 - *Employment of radiofrequency technology (RFId) in grapevine nursery traceability*. - Adv. Hort. Sci., 23(2): 75-80.

CUNHA C.R., PERES E., MORAIS R., OLIVEIRA A.A., MATOS S.G., FERNANDES M.A., FERREIRA P.J.S.G., REIS M.J.C.S., 2010 - *The use of mobile devices with multi-tag technologies for an overall contextualized vineyard management*. - Computers and Electronics in Agriculture, 73: 154-164.

LUVISI A., PAGANO M., BANDINELLI R., RINALDELLI E., GINI B., SCARTÒN M., MANZONI G., TRIOLO E., 2011 - *Virtual vineyard for grapevine management purposes: a RFID/GPS application*. - Computers and Electronics in Agriculture, 75: 368-371.

LUVISI A., PANATTONI A., TRIOLO E., 2012 - *Electronic identification-based Web 2.0 application for plant pathology purposes*. - Computers and Electronics in Agriculture, 84: 7-15.

PEETS S., GASPARIN C.P, BLACKBURN D.W.K., GODWIN R.J., 2009 - RFID tags for identifying and verifying agrochemicals in food traceability systems. - Precision Agriculture, 10: 382-394.