SUMMARY

The Hazard Analysis and Critical Control Points (HACCP) is a preventive system, aimed at ensuring food security and harmlessness and identifying specific threats related to a certain food or drink. The HACCP system can be implemented throughout the whole food chain, starting with the purchase of raw materials and ending with the product production, distribution, sale and consumption. Apart from increasing food harmlessness, its implementation also provides some other significant advantages, such as facilitating controls carried out by regulatory authorities and stimulating international trade due to the increase of confidence in food harmlessness. Moreover, the implementation of the system in this kind of industries is aimed at reaching another objective, not viewed as a priority yet, but extremely important, namely, improving product quality, in order to increase consumer's satisfaction and security, while improving company image and competitiveness, and offering companies the possibility to gain new markets.

In Spain, as well as in all the other wine-producing countries around Spain, viticulture and viniculture play a prime role, which is important not only from an economic perspective, but also from a social one, since they require the existence of a permanent population in rural areas, as well as from an environmental perspective, since this crop is the only one that can exist in certain areas, owing to their perfect adjustment to Mediterranean climate conditions. Romania is the fifth European country in terms of vineyard areas, the sixth European grape producer after Italy, France, Spain, Germany and Greece, and the sixth European wine producer after France, Italy, Spain, Germany and Portugal.

The main goal of this Doctoral Thesis is to prepare a Guide to the Implementation of the Hazard Analysis and Critical Control Points (HACCP) in the wine, vinegar and distilling industry, both in Romania and in Castilla-La Mancha. The Guide should include the following lines: "Young Red Wine Production", "Mature Red Wine Production", "White Wine Production", "Rosé Wine Production", "Sweet Red Wine Production", "Wine Bottling", "Vinegar Production" and "Wine Alcohol Production". The implementation of the HACCP system is aimed at identifying and evaluating risks related to the above-mentioned lines and stages within each line, which are part of the wine and derived products

sector, in order to identify the specific operations for which control procedures would be effective.

24 companies, both wine, vinegar and alcohol production as well as wine, vinegar and alcohol transformation and marketing companies from Romania and the Castilla-La Mancha Community have been visited, in order to write this thesis. Following a thorough visit, the facilities, the equipment and the working processes have been analyzed and a series of working guidelines have been laid down for each of them, as follows:

- Flowchart analysis, from the reception of raw materials to the delivery of the end product.
- Identification of potential risks or hazards linked to the production processes at each of their stages, based on the chart for the implementation of the APPCC system.
- Identification of the points, procedures and operational stages that can be kept under control, in order to remove threats or minimize their emergence (Critical Control Points, CCPs).
- Establishment of critical limits that must be complied with in order to make sure that each CCP is under control.
- Establishment of a surveillance system to ensure control over CCPs, by means of programmed tests and observations.
- Identification of corrective actions which will start up when the surveillance of a specific CCP indicates that the latter is not under control.
- Establishment of a registration system, where procedures and data related to the above-mentioned principles will be stored.
- Establishment of general norms of hygiene practices for the staff and for the facilities and equipments as well.

Prior to the implementation of the HACCP system, a set of acting plans labeled together as “Prerequisites” must be implemented. These prerequisites exist in most of the production stages of industries, irrespective of the sector where the activity is carried on, and their aim is to keep general hazards under control, thus leaving the specific product- or process-related hazards to the HACCP Plan. These Prerequisites are included in the following Control Plans:

- *Water Control Plan:* The main goal of this Plan is to ensure that the water to be used in different wine industries and technological processes, as well as the water used, in general, for cleaning and disinfection is drinkable, as defined by the legislation in force.
- *Cleaning and Disinfection Plan:* The main goal of this Plan is to reach proper levels for the cleaning and disinfection of all types of elements which may affect the hygienic-sanitary quality in the wine industry, with a view to avoid, reduce and prevent the development of pathogenic and altering microorganisms.
- *Handlers' Training and Control Plan:* The main goal of this Plan is to ensure that food handlers will acquire proper knowledge in terms of food hygiene and security (working instructions) and will use it correctly in their daily work.
- *Maintenance Plan:* The main goal of this Plan is to ensure the functioning of the equipments and the facilities, in order for them to be correctly used, and keep all the facilities in the wine industries, as well as the machinery and tools that are being used in proper conditions, with the aim of minimizing the probability that a physical, chemical or biological threat could undermine food harmlessness.
- *Control Plan for the Elimination of Insects and Rodents:* The main goal of this Plan is to establish preventive measures aimed, in this case, at the elimination of animals viewed as a plague.
- *Plan for Control over Providers:* The main goal of this Plan is to guarantee the origin and the sanitary security of raw materials, ingredients and materials that get in contact with food.
- *Traceability Control Plan:* The main goal of this Plan is to keep track of the marketed products, so that companies could trace and withdraw them from the market in case a public health threat is detected.
- *Waste Control Plan:* The main goal of this Plan is to carry out a correct management of all the waste resulted from the wine, vinegar and alcohol industry and to ensure proper storing conditions.

- *Hygienic design of facilities and equipments:* Complying with the technical-sanitary legislation for facilities in the industries is one of the fundamental requisites for correctly enforcing hygiene practices.

Consequently, when implementing the HACCP system in the wine and derived products industry, we should first make sure that the previous hygiene requisites are complied with and that they are documented, registered and filed, as they usually say that “what is not written down, does not exist”. Most of the detected threats are physicochemical and microbiological ones and they can be easily removed if all the previously established plans are complied with.

There are three types of main hazards: Chemical hazards, which may emerge from the remains of plant-treating substances used to treat the raw material (grapes), when the security period has not been allowed to elapse; from handling processes, when the dosage used is not the established one, or from environmental pollution, when pre-established plans are not rigorously carried out. Physical hazards, which may emerge both from the raw material and from the product throughout all the production and processing stages. These hazards are the following ones: Improper squashing of grapes, improper control of process temperature and pressure and insertion of foreign objects during the bottling process, such as pieces of glass, insects, fragments of cork, cardboard, etc. Finally, microbiological hazards, which may emerge, just like the previous ones, at any stage or moment throughout the productive process, because of precarious sanitary conditions of the vineyard, means of transport that do not comply with the necessary hygiene requisites, unthorough controls of the wine-cellar, both physical (temperatures) and chemical (improper use of antiseptic products); in other words, a certain type of hazards will engender another type if they are not removed in due time. Also, water is a very sensitive agent for a good control at any moment and in any process, as it can give rise to all three types of hazards.

For each of these hazards, some preventive measures have been established, in order to permanently avoid that the process is endangered. Basically, these measures will be enforced by establishing a surveillance and analysis system, as well as some acting protocols for each moment and point of the process. These measures consist in checking the remains of pesticides in the grapes, checking whether the added substances have been used properly and

whether maintenance and cleaning protocols are complied with, keeping physical constants of the productive process under observation and carrying out a microbiological control throughout the whole working line. Just as before, all this will be comprised in a working protocol.

En each case, some limits will be established. Theses limits, which must not be exceeded, will indicate whether the process can be carried on till the end or whether it should be stopped and restarted. The limits are legally established and we must make sure that they are never exceeded or, even better, that the process is carried on way below them. Sometimes, these limits are quantified (amount of sulphur, dosage of clarifying substances, etc.). Some other times, the limits are more categorical and refer, for instance, to the presence or absence of foreign bodies. There are also cases when, despite the fact that the limits are wide, good control improves product quality, if we were to refer to temperature and fermentation.

It is preferable to avoid hazard situations, but should they occur, that does not entail the end of the process. When confronted with such situations, certain actions (corrective measures) will be established the same way as before and these actions will be aimed at minimizing the hazard or damage caused to the process. Thus, for instance, if the dosage we use for a certain product exceeds the limit, we can always add some more untreated product, or if the temperature goes beyond the limit, we can add some colder product, etc. Such hazard situations may appear to be helpful, as they trigger a signal that something is not functioning properly, for example, if the temperature gets too high, this means that there is something wrong with the cooling equipment.

Regardless of whether the incidents occurred during the process are solved or not, they must all be registered on some kind of support: either paper or digital support and a person in charge, who will sign for the registered incident and take responsibility for the work well done, should be designated in each point.

In order to implement the HACCP system, the company must comply with various European Union norms, which require the implementation of this self-control system, and increase its product quality, above all. Owing to this system, the implementation of which will require some adjustment time, the following short- and medium-term advantages will be gained:

- Get better quality products
- Reduce the number of marketed defective products, which will improve the company' quality image.
- Cut back on expenses with final analytical statements.
- Ease and quickness in detecting failures, owing to the documentation and registration of all the operations.
- Better integrate workers and establish favorable working habits with a view to implementing new quality systems in the company.
- Increase company's competitiveness both on domestic and on foreign markets, thus increasing sales.
- Put the quality standards of the products manufactured in the two countries on the same level, thus removing conceptual barriers, according to which the products manufactured in one country have a poorer quality than the ones manufactured in the other country.
- Put domestic technicians' professional abilities on a level with those of technicians from the other country, because both domestic and foreign technicians are ready and determined to get high quality indexes for their products, by using similar working methods.

As a conclusion, the essential elements from a hygienic-sanitary perspective and which have significant consequences on Food Security, are the following ones:

- Information and training for the staff in charge of handling all the processes in the industrial chain, from the raw material production till obtaining the end product and subsequently until it gets into the consumer's hands. Thus, when confronted with a doubt, the staff will always be able to sensibly decide for themselves whether a specific operation is viable or not and move away from the previously established working protocol.
- The importance of viticulture, along with the observance of good agricultural practices, security periods when plant-treating substances are used and compliance with maintenance and cleaning programs of the working facilities and equipments.

- The means of transport used for the raw materials and the end products, as part of the production and distribution chain, must comply the same way with previously established maintenance, cleaning and disinfection protocols. Supervision of the protocols and compliance with them must be guaranteed.
- All auxiliary products used in the vinification, vinegar and alcohol production processes must have a technical card, comprising detailed information on their shape, dosage to be used and storage norms that must be complied with, as well as a security card, providing information on how to proceed in case the product gets altered or is improperly used.
- Any process that requires movement, change of place or addition of new products to the wine, vinegar or alcohol, also entails a risk which should be constantly kept under observation. Thus, we can highlight the raw material *reception processes*, when the raw material is moved from the means of transport into the production facilities, *the transfer processes*, when the wine is moved from one tank into another, in order to proceed to a new stage of the productive chain, and *the clarification processes*, when, in order to obtain the desired product, certain products are temporarily added to the wine, being later on removed by the filtration process.
- A special case is that of *the bottling process*, which groups together all the above-mentioned processes and which, apart from the risks related to the product we are working with and the added products, also entails bottle-related risks. Since this is the final stage, we should take maximum precautions and strictly comply with the established working norms, maintenance, cleaning and disinfection protocols.

From the perspective of State Administration, it is advisable, not only for economic or administrative reasons, which are, anyway, important, but especially for Food Security reasons, that the data bases of each and every agroalimentary industry are updated. All production processes should be subjected to control, thus enhancing process transparency, as well as avoiding fraud and the possibility that food products could reach consumers without having been subjected to any quality control, which leads to high hygienic and sanitary risks.

It is also advisable that all these data bases are of public use, thus putting all the information at the disposal of the citizens, consumers, students, scientific and research personnel.