Chemical Risk Assessment for Workers

Employed in the Wine Sector

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Abstract

The use of chemicals has raised more than a doubt in the public interest on the actual capacity of the active principles to enter the food chain. No less important is the discourse concerning the safety of workers that, using industrial formulated to fight the adversities of grapevine, appear to be directly exposed to products which, by typology and dangerousness, could determine professional diseases.
The research was carried out in seven wine farms (4 organic and 3 conventional). Aim of the research was to assess whether the work performed by workers (authorized in handling chemicals) was in accordance with good practice for the prevention of occupational accidents and diseases; furthermore to assess the degree of training and information of workers. The results show that during the pre-treatment phase workers partially respected company procedures; in the treatment phase the procedures were followed by all workers while in the post treatment phase significant inconsistencies were observed.

Keywords: Grapevine, Chemical Hazard, Exposure, Occupation, Test for Workers

1 Introduction

The wine sector has always been one of the main Italian working sectors in the national economy: with 388,881 business units [1], including producers of wine grapes and table grapes, and a production of 48,161,156 hectolitres of wine [2] (year 2013), Italy is, with France, among the major wine producing countries. Undoubtedly, the number of occupants in the sector presents significant values; but it turns out to be rather difficult to determine those that, in wine companies, manipulate and distribute chemicals used to fight grapevine diseases. In a wine company, the quality and quantity of agricultural production is also due to the struggle against fungal diseases and parasites.

This encourages firms to use chemicals at high doses that, by type and chemical characteristics of active principle (A.P.), show a significant toxicity both men, resulting for worker in occupational diseases, both for plants (phytotoxicity), animals and environment [3,4,5].

From the point of view of controls by the competent territorial authorities, we must take into account that the seasonal nature of work activities and especially the actual execution of the chemical treatments linked to precipitations do not allow the inspectors to carry out continuous and targeted monitoring at the workplace.

As it regards the exposure to chemical agents we must take into account that it affects not only specific category of workers but also the entire staff that, in the case of smaller vineyards and especially near to farm centres and at certain environmental conditions, may be exposed to the drift of distributed products.

The intensive use of chemical products in agriculture exposes in an unconscious way also the population, because the A.P., for physico-chemical properties, may exhibit a significant persistence in the environment penetrating in the ground, and then in the groundwater, and in the human and animal chain foods [6,7,8,9,10].

Following the operators during the pre-treatment phase we observed if they used the Personal Protective Equipment (PPE) for the preparation of the mixture
to be distributed; if they disposed off in an appropriate way the product packaging and if they adequately stored the opened packages.

During the treatment phase, in the case of use of machines without cabin, we observed if a greater exposure to the sprayed product occurred according to various aspects of climate.

Finally, in post-treatment phase, we observed whether and how the operators cleaned the machinery's surfaces, and how they eliminated the PPE. Through the verification of safety data sheets of the formulations, we also identified the A.P. used in all companies.

2 Materials and methods

The study was carried out through inspections and divided into two phases. It was conducted on a sample of seven farms (four organic farms and three conventional farms). The total area dedicated to the wine production is equal to 168 ha and a total of 10 employees is authorized to chemicals’ use and distribution.

The monitoring has lasted throughout the year cultivation of wine farms, more precisely from the end of April (the first period of treatment between the rows of vines) until the end of July (last treatment).

The first phase has been to create both a series of questionnaires, to be filled out by workers, both a verification protocol for the work phases monitoring.

In the questionnaire submitted to workers a question on the presence of working procedures (developed and written for the execution of the work, for the phase of preparation of the mixture, for the phase of distribution of the product in the field as well as for the cleaning of the machinery at the end of working) was done. In addition, in the questionnaire were asked if, in compliance with the regulations of legislative decree 81/2008, the Italian law regarding health and safety in workplaces [11], workers were, or they felt, adequately informed and trained on the risks related to work activities under analysis.

It was also asked how long the operator executes the distribution of the products: this is in order to evaluate the actual experience of the worker. Moreover, if he knew the risks due to the chemicals used in the farm and if, during the phases of handling and administration of the formulations, he uses PPE also evaluating any inconvenience (or good comfort) when they are worn during all work stages when their use is required.

The second phase of the study focused on observations of the operators to assess the presence of congruence between what was said in the tests and the actual execution of the work. On a specific questionnaire it has been reported the implementation methods of the handling and distribution phases of products. It was subsequently examined the effective use of PPE, the type of PPE used and its degree of protection to assess its suitability. It is to be noted that in some farms machines with cab have been used for the distribution in the field of the product; in these cases the filters of the ventilation system of the cabins and the frequency of replacement of the filters were observed.
Through the inspection, it was also detected the quantity of product administered, as well as the commercial name of the formulated product, in order to evaluate the specific safety card, identifying the A.P. and their percentage in order to determine the specific quantity.

The observation is then continued in the field to see if, in case of machinery without a cab, the operator on the vehicle was hit by the "cloud" of vaporized product.

The analysis in the post-treatment phase has focused on the operations of elimination and disposal of PPE to assess whether these were eliminated correctly while avoiding a direct contact with the product present on the surface of the device itself and if they were thrown in appropriate containers to ensure proper disposal.

Through the verification of safety data sheets of the formulated products, the most used A.P. in all farms, with significant toxicity, were Mancozeb [12, 13, 14, 15], the category of Dithiocarbamates, and Copper [16, 17].

3 Results

3.1 First step: farms organization

The survey conducted on the sample of workers in the farms (Figure 1) has revealed that most of interviewed workers (90%) are doing this job for more than three years. Therefore it can be seen that the level of experience in the handling and distribution of chemical formulas is significantly high. In fact, 30% of workers in most representative group, has performed this work both in organic wine farms, where the use of chemicals is clearly defined and limited by rigid discipline, both in conventional farms, where the usable range of products is much more extensive and in some cases even more dangerous.

Figure 1 – Employees Years Experience
All those interviewed, both with multi-year work experience both no experience, agrees about the dangers of chemical formulas used in farms (100%) although the question concerning the information and training in accordance to articles 36 and 37 of the legislative decree 81/2008 (Figure 2) shows that the legal obligations have been complied only for 70% of workers.

Figure 2 – Information and training of workers

Not always the certificates of successful information and staff training, are synonymous of good communication, though, when asked if you feel adequately informed and trained on the risks associated with this work activity (Figure 3), 70% who respect the law articles, 65% said they had not received adequate information to fulfill this obligation.

Figure 3 – Level of training and information
With regard to the presence of work procedures for proper handling and distribution of chemical products (Figure 4), as well as on a proper removal and disposal of PPE (Figure 5), the data analysis show that in 90% of cases specific procedures for the work execution are present and in 60% of cases there are procedures for the removal and disposal of PPE.

The use of PPE is inevitable when handling chemicals. The PPE are made available by employers and are used by 100% of workers considering that, in their written statements, they consider their use as fundamental for the protection of their health. Only in 10% of cases workers believed that the degree of PPE protection
is not able to ensure an adequate protection, while another 10% did not respond to this question.

20% of workers manifests unease and discomfort in wearing PPE, 20% said sometimes, while the remaining did not show any discomfort.

It is important to note that 67% of those who responded "yes" or "sometimes" to the question regarding the discomfort due to PPE, consider this condition due to a not suitable device, while 33% associate it with the improper use.

### 3.2 Second step: monitoring in the vineyard

Observing the work actually performed by workers, numerous inconsistencies emerged in comparison to answers in the questionnaires compiled by workers.

If the law recognizes both the information and training as workers obligations as well as the development of procedures inside the company for protection of workers, the work actually done in the farms highlights a significant lack both in the implementation of procedures, both in the use of PPE.

Observing the workers during the various phases of pre-distribution of products in the field, such as in handling chemicals and realization of the mixture, significant data in sharp contrast to the responses of the questionnaires emerge, with a lack in the fulfillment of the procedures in 100% of the sample (Figure 6).

If in the pre-distribution phases we observed significant discrepancies between the responses of workers and monitoring observations, in the distribution of products in the field (Figure 7) we observed an important and significant application of procedures that reduce the risk of exposure to chemicals.

In fact, during the distribution process, four out of seven farms use cabs machinery equipped with suitable filters with activated carbon while three out of seven wear appropriate PPE, thereby fulfilling the compliance procedures.

![Figure 6 – Implementation of procedures during pre-treatment phase](image)
In post-treatment phases (Graphic 8) we observed that during the cleaning phases of the vehicle only 60% of workers persists in maintaining PPE against 30% that eliminates them, while 10% remains only partially wearing some PPE, such as gloves and sometimes suits while the respiratory PPE are eliminated.

In the elimination phase of PPE about 90% of workers partially implement or not implement procedures to properly remove PPE determining in this way a direct contact of the chemical formulated with skin.

If in the first two steps of post-treatment activities there is a negative gradual increase of the lack of implementation of specific procedures, when the worker is called to implement a suitable procedure for disposal of dirty PPE in special containers for specific waste, 70% of workers, applies the disposal procedures.

Figure 7 – Implementation of procedures during treatment

Figure 8 – Implementation of procedures during post-treatment phase
4 Conclusions

As it is well known, exposure to chemicals determines the occurrence of immediate allergic reactions (dermatitis, skin and respiratory tract irritations, etc.) or chronic reactions that occur in the long term, thus giving rise to occupational diseases.

The survey has highlighted as, in spite of the fulfilments with legal obligations certified by training and information courses to which workers attended, the working reality differs significantly from that stated in the questionnaires.

If it is true that there is a 10% of workers that do not know the degree of hazard of chemicals handled, it is also true that all workers are aware of the intrinsic danger of the formulations and, as a consequence, use personal protective equipment to protect themselves from exposure.

It is important to emphasize, however, that the use of PPE is not implemented in all the phases in which the assigned to the treatments operator manipulates the chemical formulated, resulting in a certain way an exposure that, albeit minimal and prolonged in time, increases the probability of occurrence of occupational diseases.

It must therefore be emphasized, not only on an awareness of the workers to constant use of PPE in all work phases, but also an implementation of company procedures that define the criteria and methods of use and disposal of PPE appropriate to the level of risk to which the employee is exposed.

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