1 FINAL PUBLISHABLE SUMMARY REPORT

1.1 Executive Summary

The European project STABIWINE (FP7-SME-AG, n. 314903) developed a new technology for wine tartaric stabilization that presents significant qualitative, technological, environmental and economic advantages on practices currently applied by the European wine industry.
To avoid the formation in the bottle of crystals of tartaric acid and potassium, two natural components of grape, that form a deposit disliked by the consumers, winemakers stabilize most wines before bottling. Two main stabilization strategies are applied by EU wineries: subtractive approach through cold treatment, electrodialysis and exchange resins, or use of additive inhibiting crystallization. Subtractive techniques have high environmental and economic costs, and none of the additives presently available can be efficiently used on any type of wine.

The solution was found in the use of potassium polyaspartate, a polyaminoacid whose study highlighted several positive characteristics:

- is more efficient than all other additives in inhibiting the formation of tartrate crystals;
- it works in all wines of different types, origins and instability levels;
- has no effect on taste or aroma of wines, even at very high dosages;
- is stable over time, contrary to metatartaric acid;
- does not cause color instability as for carboxy-methyl-cellulose in some red wines;
- does not show fouling effect at membrane filtration
- is produced from natural and renewable row materials
- is totally biodegradable and constitute no danger for the operators.

The practice has the lowest carbon and water footprint among all tartrate stability treatments; its cost of the treatment is very low, and it can be easily adopted even by the smallest wine producers. For what concerns human safety, potassium polyaspartate is considered a harmless substance: studies within Stabiwine project showed total absence of toxicity, immune-stimulation and mutagenic effects.
The procedure for authorization of industrially produced potassium polyaspartate as wine additive has been already started at OIV, EU and national level: once completed, the polyaspartate will become a revolutionary alternative for wine stabilization, and will allow very significant economic and environmental saving by wine producers, including micro-wineries not having access to expensive technologies.

A second pillar of the project aimed to find an alternative to bentonite fining for protein stabilization. A small residue of grape proteins is present in many wines, and can it form haze in the bottle if accidental heating occurs during distribution: prudentially, all wineries willing to avoid the phenomenon treat the wine before bottling, adding a natural clay able to absorb the proteins and drag them to the bottom of the tank to be eliminated by racking. Albeit very efficient and economic, bentonite is not liked by many winemakers for the loss of flavor and product linked to the treatment. The project developed a new polymer, based on natural ingredients like starch derivates and grape organic acids, having absorbing efficacy similar to bentonite, and respectful of wine quality.
The phases of industrial scale-up of the polymer synthesis process, and of elimination of any practical problems potentially occurring with its use in commercial wineries, are presently ongoing.

1.2 Summary description of project context and objectives

The goal of STABIWINE project was the development of alternative practices for protein and tartaric stabilization of wine, that are important phases of winemaking, particularly for wines exported and sold through organized distribution that undergo long traveling and long storing periods often in not totally controlled conditions. The stabilization technologies in use, albeit effective, have some negative side impacts on wine quality, production costs and environment, and for many decades the wine producers – in Europe and overseas - have looked for alternatives.
A possible solution is offered by the use of biopolymers, i.e. compounds of natural origin, obtained from secondary products of the agro-food industry and already exploited in pharmaceutical and cosmetic sectors.
The project was composed of two major activity pillars, one devoted to the development of a new processing aid for protein fining, and a second developing a new additive inhibiting the formation of tartrate precipitates in the bottle.

Polyaspartate: a biopolymer for sustainable tartrate stabilization of wines

A polymer of aspartic acid can substitute wine refrigeration in the phase of stabilization of wine against precipitation on tartrate crystals in the bottle; this is the innovative finding of the European project STABIWINE.

Naturally, wine contains tartaric acid and potassium, absorbed by the vine from the soil into grapes. These two elements are normally present in concentration above saturation: if the wine is not stabilized, crystals of potassium tartrate can form during storage, giving origin to deposits in the bottle that are completely harmless, although not appreciated by consumers.

Presently, most wines are stabilized by mean of subtraction method: they are chilled at few C° degrees below zero and kept in these conditions for some days, in order to induce formation of crystals that will be then removed by filtration. This method requires significant investments in a powerful refrigeration system and insulated tanks; in addition, the energy needed to cool down the wine and kept its temperature below zero significantly contributes to the carbon footprint of a winery. Moreover, refrigeration and filtration are critical steps for the wine quality, that can be drastically reduced in case of incorrect management of these phases.

Polyaspartate added to wine even in very low dosage has been found to inhibit the formation of tartrate crystals; the natural wine composition is not altered by subtraction of salts, and no refrigeration or other physical process are required.

Currently, other winemaking practices follow the same additive method: addition of metatartaric acid, carboxy-methyl-cellulose or yeast mannoproteins. Nevertheless, because of limited efficacy of the former two additives, or of cost of the third, these technologies are far to be universally applied.

Microsponges: a reticulated polymer for protein stabilization of wines

Many wines, especially whites and rosé, have a natural content of proteins that, in case of accidental heating during storage and transportation, can give origin to haze negatively perceived by consumers. In particular, two types of proteins (TLP and chitinase) produced by the vine in response to pathogen infections, seems to be the most unstable fractions.

Presently, protein stabilization is reached in wine production by addition of bentonite, a clay able to absorb positively charged molecules – like unstable proteins at wine pH – between its layers and to drag them down while settling. The lees are then eliminated by racking or centrifugation, living a stable wine ready for filtration and bottling. Although effective, inexpensive and widely adopted worldwide, bentonite fining is not beloved by many winemakers claiming that this non-specific treatment is reducing wine sensory quality. Sustainability performance of bentonite fining is also weak: together with lees, a significant amount of product is wasted (3-10% of volume) causing economical damage, and inter-continental freight of high amount of bentonite are at the origin of relevant GHG emission.

Stabiwine project aimed to developed a new processing aid able to absorb the unstable fractions of wine proteins, alternative to bentonite, obtained through renewable sources and without organoleptic effect on wine.