Abstract: This work sought to understand how the chemical composition of cork, in cork stoppers, affects the chemical and sensory characteristics of wines. To achieve this objective, the work focused on three distinct parts, starting with the chemical characterization of cork, particularly in terms of its phenolic composition, followed by the way in which some compounds present in cork can affect the color and flavor of the wine, and finally the detection of these compounds in white and red wines.

The results obtained in the first part of the work showed that it was possible to extract phenolic compounds from cork, both by traditional maceration and by the two extraction techniques used (UAE and MAE).

This was followed by the study of the reactivity of different fractions of cork, of different molecular weight, with salivary proteins. This study demonstrated that all of them have the capacity to precipitate salivary proteins and contribute to astringency phenomena. Furthermore, there also seems to be a matrix effect (presence of other compounds) on the ability of these compounds to interact with proteins. Moving on to the co-pigmentation process, PGG and sinapic acid were chosen as reference compounds in cork to be used as co-pigments, and both showed a great ability to complex with malvidin-3-O-glucoside.

Finally, moving on to the impact on the wine, the results revealed that the cellar conditions and the orientation of the bottle closed with a natural cork stopper have an impact on the chemical composition of the corresponding Port wine. The samples stored in the traditional cellar, with greater temperature ranges, showed a greater yellow hue, less tannin specific activity and higher levels of furfural and 5-methylfurfural (oxidation markers). In addition, samples stored horizontally showed significantly higher levels of total proanthocyanidins and higher tannin specific activity than samples stored vertically. A derivative of ellagitannins (Corklin) was also detected in wines stored in a horizontal position, which results from the reaction of cork compounds with the phenolic compounds present in wines. In line with the search for compounds that can be formed by the interaction between wine components and cork stopper components, a new catechin-caffeic acid adduct was successfully identified.

In general, this work allowed us to increase knowledge about the capacity of the compounds that migrate from cork to wine and how they can affect their sensory characteristics.

This information can be of great use to the cork and wine industry as it can direct the class of stoppers that are most suitable for the type of aging that the producer wants for his wine.