

Abstract

Wine is a principal component of Greek and global diet, and has been inextricably linked to the culture, tradition, and everyday life of humans over thousands of years,. Numerous studies have demonstrated the beneficial properties of wines and extracts generated from them, however, the existence of such investigations in Greek wine varieties are scarce. Based on the above, in the present PhD thesis, a thorough and holistic assessment of the bioactivity of four emblematic Greek wine varieties in *in vitro* cell-free, *in vitro* cell-based, and *in vivo* models was conducted, based on a reliable and well-established methodological approach. More specifically, the biological effects of wine samples and extracts of Xinomavro, Agiorgitiko, Assyrtiko, and Malagouzia grape varieties were evaluated. According to the results, the examined samples were characterized by high polyphenolic content and exerted potent antioxidant and antimutagenic activities. Furthermore, the results from the cell-based systems showed that the examined samples acted protectively against the detrimental effects of free radicals, by confining lipid and protein oxidation and by increasing the antioxidant capacity at different concentrations and cell lines, depending on the varieties. Concerning the *in vivo* results, the consumption of the Xinomavro extract induced both beneficial and harmful outcomes on the redox status of Wistar rats, depending on the tissue. It is worth mentioning that this investigation was the first one in the international literature to evaluate the biological effects of wine and extracts from the Greek Xinomavro variety. The obtained findings could offer valuable insight towards the enhancement of the added value of Greek wines, thus enhancing their competitiveness at the international level. Concomitantly, the methodological approach introduced herein can be considered a useful tool for the easy and rapid assessment of the antioxidant properties of Greek and other wine varieties, and their individual role in the protection of human health and well-being.