

## **The influence of copper-based fungicide use in soils and aquatic sediments. Case study: Aetoliko lagoon, Western Greece**

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In the study area, in order farmers to keep their olive trees healthy, the first measure is to keep their olive trees well-fed that is the best initial defense against diseases. Copper-based fungicides are the most common fungicides to protect olive plantations against diseases such as the olive leaf spot. Pathogens are controlled by farmers with strategically timed disease control programs rely on copper sprays to protect the foliage and fruit from infection. Successful disease control depends on even distribution and good retention of the copper over all of the plant surfaces before the disease develops. Artificially added copper has the ability to accumulate in soils and aquatic sediments and can cause adverse effects on flora and fauna in its environment. For the present study soil and aquatic sediments field campaign was carried out in the Aetoliko Lagoon ecosystem which is exclusively dominated by olive orchards. It is for the first time in Greece that soil as well as aquatic sediments samples of one coherent protected aquatic ecosystem were taken and compared. To determine the influence that the usage of copper-based fungicides have on the lagoon and surrounding areas, ten (10) sediment samples from the bottom of the lagoon and twenty five (25) soil samples at the different olive orchards that are bordering the water body were taken. The samples were analyzed for total copper content (total digestion) and extractable copper (DTPA and  $\text{NH}_4\text{NO}_3$ ). Furthermore, soil / sedimentological and geochemical analyses such as pH, grain size, total organic carbon, total nitrogen and calcium carbonate content were carried out. The results show in over 80 % of the orchard soils a critical accumulation of the total amount of copper. In some of the examined soils the value of 140 mg/kg (as set by the European Union as a limit for total copper in farmland) is exceeded by the factors of 2 to 4.5. Copper content in the aquatic sediments is generally lower and varies between 43.85 mg/kg and 71.87 mg/kg. The values for DTPA-extractable copper are relatively very low, while the highest fractions of bioavailable copper are found on the eastern shore of the lagoon. Our study can be used as a valuable reference for future studies on this subject at the Aetoliko lagoon and similar ecosystems.