

INVESTIGATION OF MOLECULAR MODIFICATIONS BY FTIR AND FTNIR SPECTROSCOPY

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Arsenic (As), a naturally occurring metalloid, is the principal contaminant of soil, water and food especially in some eastern countries such as Bangladesh, India and China. As concentrations ranging between 25-80 g l⁻¹ higher than the limits set by law (10 g l⁻¹), have recently found in drinking water (network and groundwater) in some Italian regions, including Lazio (central Italy). The main exposure route to iAs is dietary. Arsenic-contaminated groundwater is often used in agriculture to irrigate crops for food and animal consumption, which could potentially lead arsenic entering in human food chain. Arsenic is not an essential element for plants and its over-concentration in the soil can generate toxicity phenomena. Its translocation from soil to plant constitutes one of the main human exposure ways. Inorganic arsenic (iAs) is a non-threshold, class 1 carcinogen and iAs species are thought to be more toxic than the organic ones (oAs). Epidemiologic studies have shown a significant association between the consumption of arsenic through drinking water and cancers of the skin, lung, bladder, liver, and kidney, neurologic disease, cardiovascular disease, as well as other nonmalignant diseases. The aim of this work is to evaluate, respect to the control sample, the effects of different arsenate concentrations in *Vicia faba* seedlings by FTIR and FTNIR spectroscopy. FTNIR is a spectroscopic technique that uses the near-infrared region of the electromagnetic spectrum from 800 nm to 2500 nm. FTNIR is primarily used in medical diagnostics, also has been used outside of the medical field, food and agrochemical quality control, and combustion research, as well as cognitive neuroscience research. Furthermore, *V. faba* seedlings exposed to the same As different concentrations were used to evaluate the phytotoxic and genotoxic effects by comet assay. Preliminary results obtained by the two spectroscopic techniques show the effects caused by arsenate mainly related to molecular modifications determined by the chemical interactions of As with the biomolecules (i.e. carbohydrates, proteins and nucleic acids) of plant. The genotoxicity test shows significative results as As may be responsible for DNA damage. One of the mechanisms by which DNA damage can be induced by As might be oxidative stress in *V. faba*.

Keywords: FTIR and FTNIR spectroscopy, genotoxicity tests, arsenic exposure