

## Plant comet assay in environmental studies: uses, limits and perspectives

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The comet assay is a versatile technique for measuring DNA damage in eukaryotic cells and organisms, and is increasingly used to assess DNA repair. Its main applications are in genotoxicity testing, and in human monitoring, with a so far rather neglected potential in ecogenotoxicology. This is particularly true in plant research.

Comet assay was used for the first time on plants in 1993. For a decade, the comet assay remained restricted to some toxicological studies and to few model species including garlic (*Allium cepa*), tobacco (*Nicotiana tabacum*), broad bean (*Vicia faba*), and arabidopsis (*Arabidopsis thaliana*). Since 2010, the technique was exponentially applied to evaluate diverse stressors (organic compounds, radiations, nanoparticles...), and to monitor environmental pollutions *in situ*.

However, despite its increasing applications, the comparison between the number of papers using comet assay on plants (almost 300 during the last 25 years) and on humans (more than 10 000 during the same period), highlights the gap in its uses between genotoxicology and ecogenotoxicology fields. This huge difference can be explained by (i) the difficulty to isolate numerous intact nuclei in plants compared to animal systems, (ii) the lack of a standardize protocol and guideline in plants, (iii) and the lack of a high throughput comet assay scoring method.

During the last 5 years, intensive efforts have been done to develop a robust and effective new protocol to extract plant nuclei, as well as an automated high-throughput scoring of plant nuclei. Meanwhile, several authors have used enzyme-modified protocols to detect specific base damage or DNA methylation. This opens new perspectives for the development of this technique in plant studies.

During this presentation, we will review the uses of comet assay on plants, and the main bottlenecks of this technique. We will also discuss the current developments and new perspectives.