Effects of radon exposure on the bioactive compound profile of *Mentha spicata L*.

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Understanding the effects of exposure to natural sources of ionising radiation (IR) in living organisms is an ongoing and complex task, particularly when dealing with a naturally occurring radioactive gas in particular radon. The short- and long-term consequences of this exposure require continuous investigation, especially to clarify the mechanisms underlying repair mechanisms involved. In plants, the antioxidant (AO) system and the regulation of reactive oxygen species (ROS) are key protective responses against oxidative stress triggered by environmental threats. This stress subsequently leads to the activation or repression of enzymes, proteins, or phenolic compounds involved in the detoxification of ROS. This study is an experimental investigation based on environmental toxicology and plant physiology. Its main objective is to evaluate the response of *Mentha spicata L.* (MS) when exposed to airborne radon, using both active and passive detectors in isolated chambers. Chamber A (experimental) contains not only the plants but also a mineralised rock with pitchblende, a known source of radon exhalation. Chamber B (control) has a similar setup but without the rock. The assays conducted on MS extracts included HPLC-DAD analysis, Total Flavonoids (TF) quantified using an adapted Folin–Ciocalteu method, and an adapted DPPH radical scavenging assay. The exposure system developed for this study simulates different environmental conditions, with Chamber A showing high levels of radon and Chamber B maintaining significantly lower levels. Both chambers remain sealed for 15 days during the exposure period (Cycle: #5 – Sept 2024; #6 – Dec 2024). The HPLC-DAD results as part summarised in Table 1, indicate a decrease in concentration for rosmarinic acid and myricetin compounds in plants from Chamber A compared to the control. This suggests that higher radon concentrations are associated with stronger protective responses. In other words, AO capacity, as indicated by the DPPH assay and as confirmed by the TF assay, both decrease under higher exposure. Two hypotheses can be considered: first, the activation of the plant's defence signalling pathway may have been repressed; second, the consumption of AO may have increased to counteract oxidative stress. It is known that IR leads to increased ROS production in plants; however, the aim of this study is to extrapolate these findings to animal cells. Therefore, our next step is to determine whether the reduction in these compounds occurs via enzymatic or non-enzymatic pathways, and to establish correlations with potential cellular alterations.

Table 1 – Partial HPLC-DAD result of two compounds for comparison of exposed (Chamber A) and non-exposed (Chamber B) plants.

	Chamber A			*Chamber B*		
Cycle	Radon[a]	Rosmaniric Acid[b]	Myricetin[b]	Radon[a]	Rosmaniric Acid[b]	Myricetin[b]
5	52000	1029,56	121,83	176	2103,07	200,64
6	82000	3345,51	312,11	620	4680,77	361,04

Note: a – Bq/m^3; b - μg/mL of extract.

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