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# Aging-related change in redox status inside plants disclosed using Synchrotron X-ray Methods

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Plant aging is accompanied by physiological changes like chlorophyll degradation, decreased photosynthesis, and massive accumulation of reactive oxygen specie. Whether the speciation of trace element arsenic (As) also changes during this process and the role of As speciation in As redistribution during the aging process remain to be investigated. *P. vittata* at different growth ages were collected and analyzed for As concentration, micro-distribution, and speciation using Synchrotron X-ray methods. Furthermore, metabolic profiling was conducted for *P. vittata* at different growth stages. Results indicated that the concentration of As in *P. vittata* substantially decreased with aging, accompanied by accumulation of As in rhizomes and spores. With a decrease in the reduced glutathione/ oxidized glutathione ratio and an increase in the malondialdehyde content, the main As speciation in *P. vittata* changed from arsenite to arsenate. We suggest that with the aging process, the oxidation state increases in pinnae, which oxidizes arsenite to arsenate and may have increased the mobility of As in *P. vittata*, thus enabling the transport of As from pinnae to rhizomes and spores. Results confirmed the hypothesis that with the aging of *P. vittata*, the redox potential increased in the pinnae, leading to the oxidation of As and enabling As to be translocated from pinnae to rhizome and spores. Furthermore, the speciation of As is one of the most important factors that determine the mobility of As. Studies on the mobility of different As species in plants are rare. Further *in situ* investigation on the exact form of As within plant cells may be interesting.