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Phytoextraction of Dieldrin from a Historically Contaminated: Focus On Accumulation and Distribution in Various Plant Species

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Due to past agricultural practices, agricultural soils contaminated by organochlorine pesticides (OCP), including dieldrin, are widespread. The persistence of OCPs in soil leads to vegetable contamination and restriction of land use linked to their potential toxicity for humans [1]. Some plant species, mainly belonging to the Cucurbitaceae family [2], have shown a potential to accumulate these contaminants [3]. This study aimed at highlighting the ability of a wide range of plant species, including cucurbits, to uptake, translocate and accumulate dieldrin for phytoextraction.

Ten varieties of *Cucurbita pepo* and a selection of 17 other plant species (12 botanical families), were grown in pots filled with a soil historically contaminated by dieldrin and buried outdoor on the site. The dieldrin concentration was measured in all potted soils. At the end of the cultivation period (2 to 3 months, until maturity or beginning of senescence), all organs (leaves, stems, flowers/fruits, and roots) were separated and their dieldrin concentration was determined.

The results showed i) an intraspecific variation of dieldrin concentration in C.pepo fruits and flowers, but not in the vegetative organs (roots, stems, leaves), ii) an interspecific variation of dieldrin concentration in the different organs. Dieldrin distribution in the plant parts significantly differed between *C. pepo* varieties and the other plant species. Mainly, it was observed that C. pepo accumulated more dieldrin in the aerial parts than all the other species, with concentrations following the decreasing order: stems > roots ≥ leaves > fruits for C. pepo while it followed the decreasing order roots >> leaves > stems ≥ fruits/flowers for the other species. This highlights a higher ability of C.pepo to translocate the contaminant above ground. Concerning the phytoextraction potential, the results showed that *C.pepo* was also the most effective species to uptake dieldrin with an extraction ranging between 150 and 350 µg of dieldrin per plant, including fruits, 90 % being found in the shoots, compared to 1.5 to 220 µg of dieldrin, 40 to 96 % being stored in the roots.

Thus, several plant species were able to uptake and accumulate dieldrin. However, only *C. pepo* showed the ability to highly translocate the dieldrin to the aboveground plant organs, and that for the ten varieties tested. For a phytoextraction option, *C. pepo* would be the most relevant candidate out of the plant species tested. Some promising non-cucurbit species were also identified, assuming that the whole plant, including the roots, would be removed. However, finding solutions to increase the OCP extraction (i.e., by increasing root biomass, OCP bioavailability and translocation) by those plant species would be needed.

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