The article by Vandervoorde et al. investigates how the presence of living plant cover, at different densities, influences the degradation of a pesticide mixture in soil. This topic is particularly relevant for understanding the environmental fate of pesticides and for advancing sustainable agricultural practices. The authors analyzed the degradation of 18 commonly used pesticides with diverse physicochemical properties under two different crop cover conditions. They monitored pesticide concentrations in both soil and soil solution and proposed a quantification of degradation in relation to pesticide properties.

Although the experimental setup - which included ten replicates and covered a wide range of pesticides under greenhouse pot conditions - provides valuable insights into pesticide behavior, the conclusions drawn in the paper appear to lack robustness. Specifically, the authors suggest that differences in residual pesticide concentrations result from variations in crop evapotranspiration and microbial degradation near the rhizosphere; however, no direct measurements were made in plant tissues, evaporated water (despite the greenhouse setup), or pesticide metabolites. Furthermore, the introduction mentions possible interactions among pesticides affecting their mobility (lines 33–34), which may complicate the interpretation of individual pesticide behavior when applied as a mixture. Nevertheless, despite these limitations, the study effectively highlights contrasting trends in pesticide mobility depending on land cover, and clearly relates them to well-known pesticide properties such as water solubility, molecular weight, and vapor pressure.

Other comments:
Introduction: The introduction mentioned “pesticides” as a whole while the results focused on differences in physico-chemical properties. The introduction (which is relatively long) could develop on these properties and then better explain the novelty of the results vs expected behavior knowing pesticides characteristic’s.
l. 28: “… diffuse contamination of other environmental compartments” I would like to have a rough quantification of this dispersion

l. 31-34 : “chlordecone adsorbed on soil particles is currently being transported to surface and groundwater bodies by soil erosion (enhanced by bare soils resulting from contemporary glyphosate applications)” not clear, please rephrase and shorten the whole sentence.

l.44 – 47 :” chlordecone adsorbed on soil particles is currently being transported to surface and groundwater bodies by soil erosion (enhanced by bare soils resulting from contemporary glyphosate applications) “ please argument what chlordecone degradation (cf l.29-30) is limited

l. 59-60 “ “enhancing microbial activity…” isn’t that the definition of phytoremediation given l.43-45.

L 61 “the mineralisation of 2,4-D.” what is 2,4 -D ???

l.62-65 sentence too long

l.69 “They highlighted the importance of soil organic carbon” be consistent during all manuscript between organic carbon and organic matter

l. 68-71 “They highlighted the importance of soil organic carbon and cover biomass production in reducing leaching, with cover crops producing over 2 tDM ha−1 significantly reducing leaching in contrast to no effects observed at 0.3 tDM ha−1 (DM: dry matter).” Not very clear, to what 0.3tDM refers, bare soil? why not null in this case?

Methods:
l.129 Was temperature maintained at 20 even during night?

l.155 “No metabolites were quantified“ not sure if they were not found or not searched

l.164 – 175: The paragraph is not very clear (but it is a good point to explain)

l.176: split the paragraph in two parts (pesticide properties and data treatment)

l.178-182 the importance of different properties should have been introduced before.

l.184 “data pre-analyses were performed in MS excel” what are pre-analyses?

l.185: put the sentence about R version (Rstudio doesn’t matter) at the end of the paragraph.

l. 200 : Which package/ function are used for the deviation tests?

Results:
l. 243-245: I don’t understand the explanation about reduced soil mass, please rephrase.
l. 290: extra point in “…60% of the variance. Separated..”

l. 290-300 : “The first dimension, accounting for 60 % of the variance, separated the molecules in two groups: (1) negative values corresponded to substances such as mefentrifluconazole and tebuconazole, which have high soil sorption, high lipophilicity, low water solubility and/or long soil persistence; and (2) positive values corresponded to substances such as clopyralid or pyroxsulam, which have low soil sorption, low lipophilicity, high water solubility and/or short soil persistence. “**1.** It is not entirely clear which data were included in the PCA analysis. Did the authors use only the percentage of the initial pesticide concentration at each sampling date, or were physicochemical properties and sampling compartments also incorporated? In line 302, the statement *“reflecting a shift towards a dominance of molecules with higher soil sorption, bioconcentration or persistence”* is ambiguous, as it is unclear which part of this interpretation is directly supported by the PCA results and which derives from the known properties of the molecules.

l. 302 please define “post-emergence”

Fig. 2: I think that it can be useful to have subpanels for left and right. Also, I don’t understand what is the right plot.

l. 320 -340: The interpretations and proposed mechanisms, particularly those related to water fluxes and the effects of crop density, are insufficiently supported by evidence..

l. 482: “Our main hypothesis highlighted the role of microorganisms in pesticide biodegradation, but we were unable to directly monitor microbial activity “. In my opinion, this sentence-and possibly the introduction as well - should be reformulated to clearly emphasize the main hypothesis and how the study was designed to address it. The statement *“our study was not designed to test our hypothesis”* seems inappropriate, as it undermines the scientific rationale and clarity of the research objective