

Incorporating realistic irradiation scenarios into light-enhanced water-sediment degradation for refined environmental exposure assessment

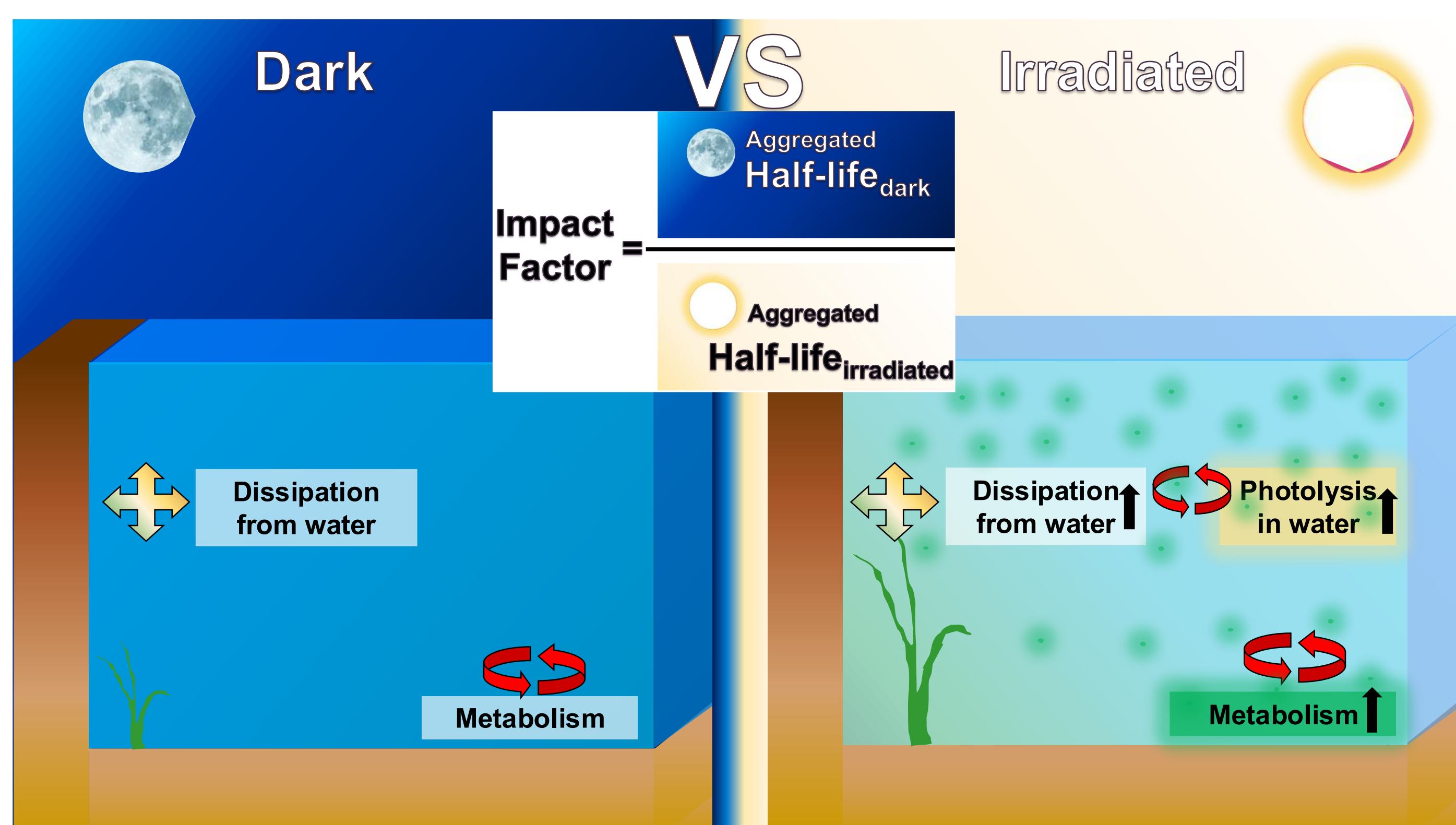


Xin You, Johannes Karcher, Martin Brüggemann, Zhenglei Gao, Dieter Schäfer

Bayer AG Crop Science Division, Germany

Light-enhanced PPP (bio)degradation is prevalent in water-sediment systems and should be considered as a refinement option in exposure assessment

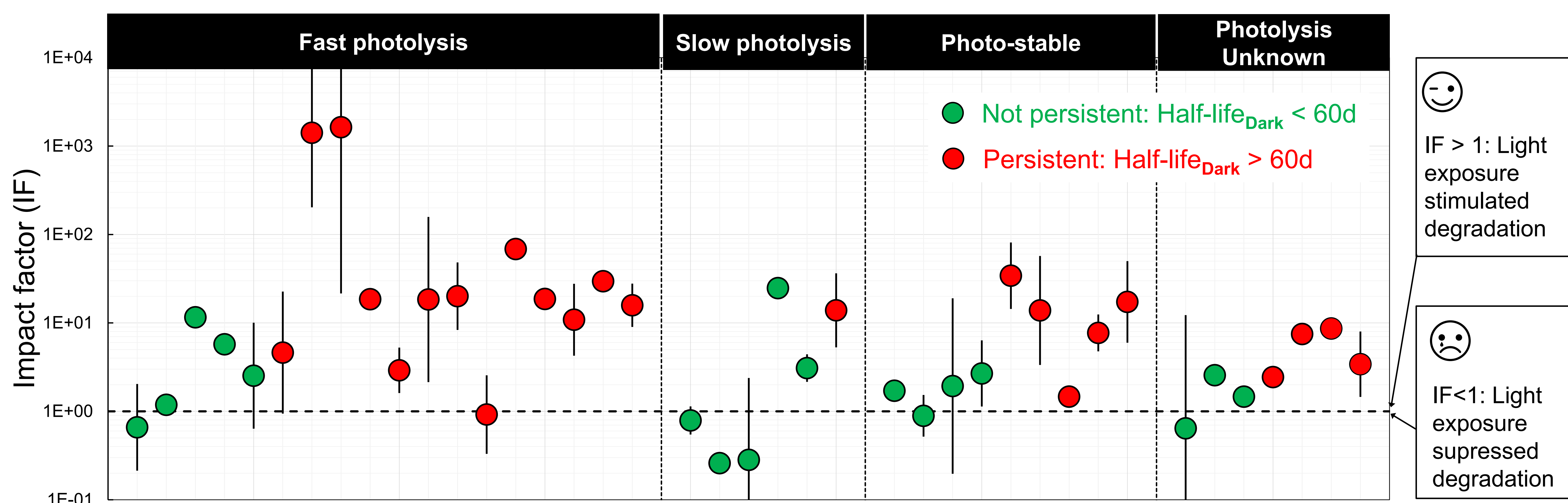
Introduction



Light modulates chemicals' environmental fate (efate), particularly in water-sediment (W-S) systems. Standard regulatory studies (e.g. OECD308) typically exclude irradiation. Especially for photostable chemicals, light is often deemed dispensable yet may significantly influence biodegradation in W-S systems. Here, we systematically compared degradation half-lives derived from dark and irradiated setups using the concept of impact factor (IF) across all EU submitted PPP active substances (AIs). We aim to elucidate light-enhanced degradation in W-S systems and to pave the way toward a more realistic and consistent consideration to incorporate irradiation scenarios in W-S studies across regulatory frameworks.

Results and Discussions

- Most AIs (75%) showed a 2- to >1000-fold enhancement in total system degradation, irrespective of their aqueous photodegradability. This indicates an overall light-enhanced biodegradation.
- Light exposure had no impact on the overall efate metabolic profiles.
- Laboratory artificial light exposure did not show different impact than natural light, suggesting its feasibility to simulate surface water conditions in the lab.



Conclusion and Outlook

- Our work showed light-exposure enhanced degradation in a more realistic W-S environment, suggesting such studies should be used as a refinement option for environmental exposure assessment in PPP registrations.
- We will also propose a workflow to define realistic irradiation scenarios (e.g. for EU FOCUS water locations) to pave the way toward a more realistic and consistent consideration to incorporate irradiation scenarios into W-S studies across different chemicals and regulatory frameworks.

