

Part 1 investigates metals and different organic compounds leaching from four different cryo-milled (grinded) tire tread (CMTT) (summer, winter studded, winter non-studded, truck winter studded) from three different brands over 21 days of simulated sedimentation (21A) and after simulated release (21B). Similar CMTT concentration (35 mg/L) used for all samples (triplicates) at room temperature with only milli-Q water. Part 2 investigates the same compounds in tunnel wash water before, during and after 21 days of sedimentation.

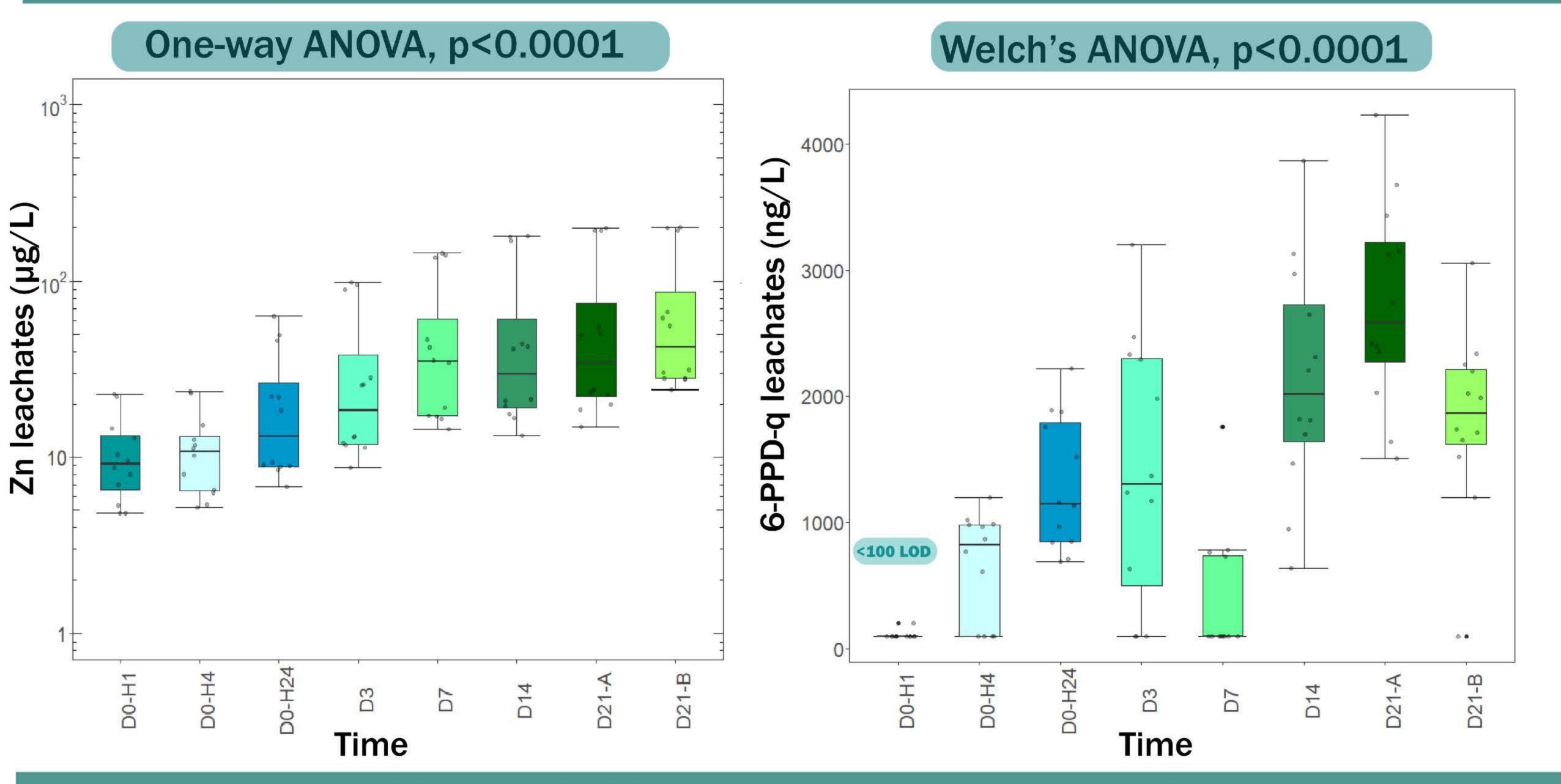
Hypotheses

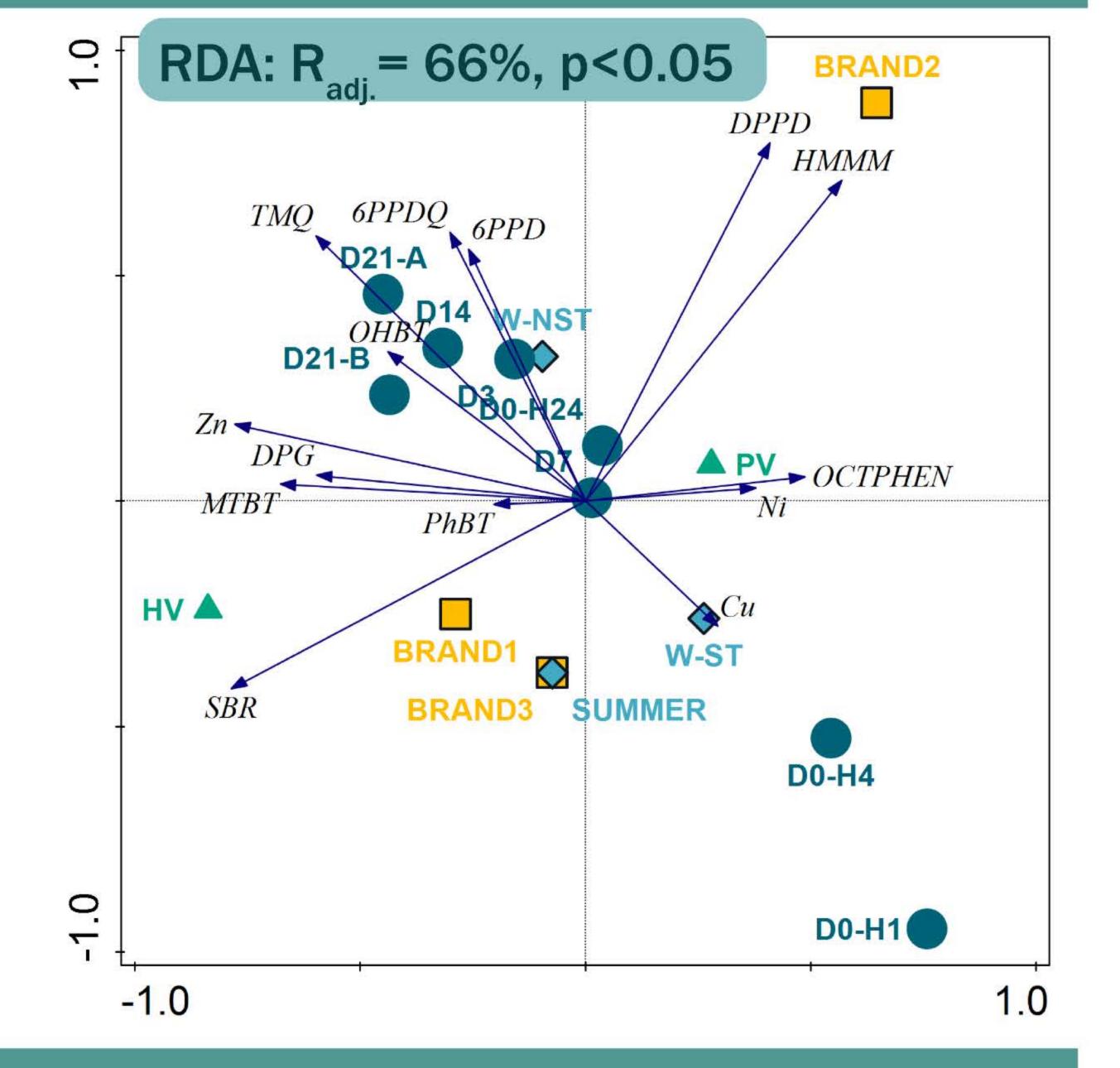
- 1) Tire type and tire brand has a significant impact on levels and type of compounds in tire-related leachates.
- 2) Levels of tire-related leachates increase with time (over 21 days) for both CMTT and TWP in the environment.

— RESULTS

21 DAYS LEACHING EXPERIMENT IN THE LAB

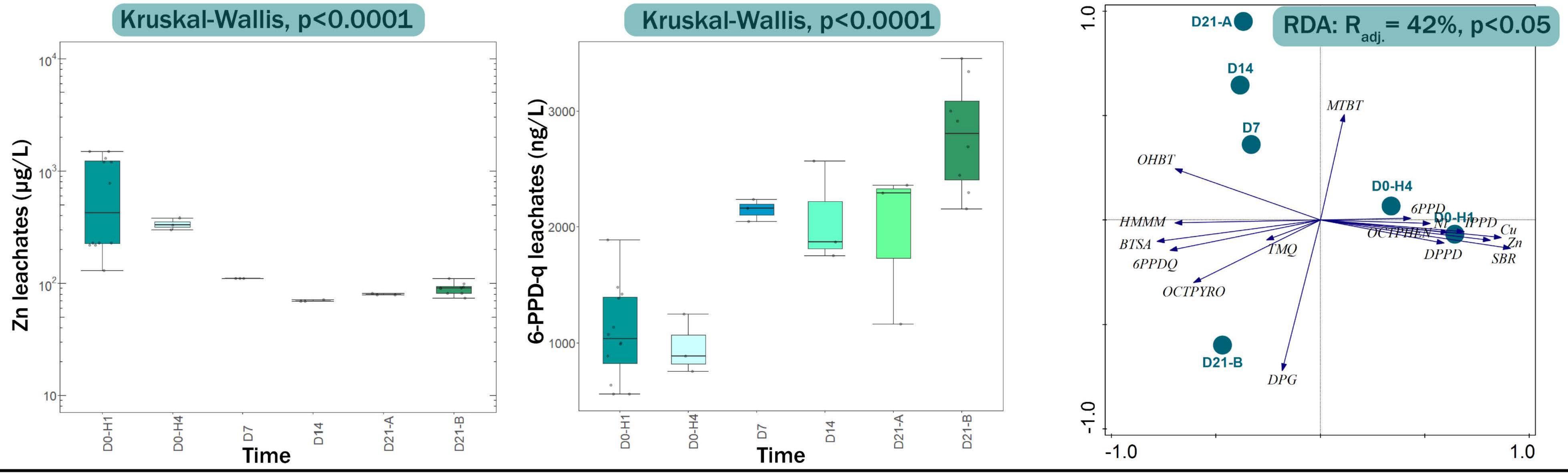
Level of zinc increased significantly over 21 days (One-way ANOVA, p<0.0001), no significant increase for Ni or Cu (p>0.05). Levels of leaching were different between tyre types for all metals (p<0.05). All organic compounds except 6-PPD and HMMM increased in concentration over 21 days. High levels of TMQ showed after 24hrs and increased 10x until day 21.





21 DAYS SEDIMENTATION TREATMENT OF TUNNEL WASH WATER

The TWP levels varied from 11-84 mg/L for untreated waters and 0.8-2 mg/L for treated water (98% retention). Metals were reduced by >84% and demonstrated strong relationship with SBR rubber (from TWP). Reduction of 6-PPD, DPPD, IPPD and OCTPHEN was >58% by day 21. For 6-PPD-Q, OCTPYR, HMMM, DPG, TMQ, OHBT, MTBT and BTSA, levels increased from 17% up to 285% when comparing day 1 to day 21.



CONCLUSIONS

Seasonality and brands had an significant impact on the levels of leachates. More research is needed to investigate how tire types impact leaching to the environment.

High reduction of metals (>84%), strongly correlated with TWP (R_{adi} > 76%). This is in strong contrast to several organic compounds increasing up to 285% during sedimentation.

This demonstrates the need to remove TWP before release into the environment to avoid continous leaching. It also has potentially major implications for the current handling of treated road water, as it is not sufficeient to remove all tire leachates.

FUTURE PERSPECTIVES

TOXICITY TESTING

The toxic effects of the TWP-related chemicals released after 21 days of leaching will be analyzed using freshwater microalgae (Raphidocelis subcapitata) and zebrafish embryos (Danio rerio). Three levels (5, 75 and 150 mg/L)of TWP will be used.

Future lab tests will include soap and road salt to simulate environmental conditions.

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Statens vegvesen



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