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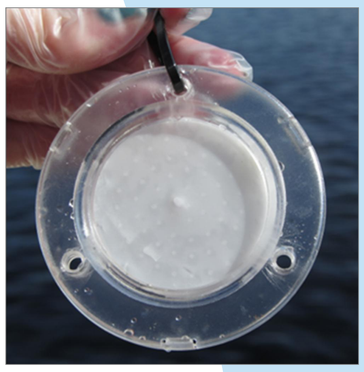
Pesticide monitoring via traditional surface water sampling and Chemcatcher® passive sampling

The concentration of compounds in surface water may fluctuate due to e.g input of effluents or spraying of pesticides. The contents can even be too low to be detected with conventional grab sampling. In 2013 EU launched a new directive which encouraged developing of novel monitoring methods. Passive sampling is recognised to be a useful technique for monitoring harmful chemicals as it combines sampling and pre-concentration of the analyte in one step.





Background

- Pesticide concentrations can vary up to several magnitudes within short time period especially in small upstream sites.
- Grab sampling describes only instant pollutant content at the time of sampling, which may give even misleading picture of the true water quality.
- During passive sampling period there can be a concentration peak which may not be detected with instant grab sample.
- Passive samplers are useful when studing time-weighted average concentrations of pesticides during two weeks sampling period.

Methods

- We used Chemcatcher passive samplers (polycarbonate sampling housing and SDB-RPS receiving phase) to monitor pesticide contents in river Savijoki during 10th May-13th Sep, 2016.
  - Two replicate samplers were deployed for 2 weeks, retrieved and replaced with new ones.
  - Grab samples were taken in every two week as the passive samplers were replaced.
- The sampling rate (R_S) was determined in a laboratory trial for 67 selected pesticides (Fig. 1).
  - The sampling rate enabled to convert the passive sampling results ng/sampler to ng/L concentrations.
  - The R_S varied from 0.024 L day^{-1} (2,4-D) to 2.510 L day^{-1} (dicofol).

Results

- With passive sampling 20 pesticides were found upstream and 41 pesticides downstream of river Savijoki.
- With grab sampling 18 pesticides were observed upstream and 30 downstream of river Savijoki.
- Passive samplers found higher concentrations of azoxystrobin than grab samples (Fig. 2).
- The presence of propiconazole (Fig. 3) can be observed with passive sampling during the whole study period.
  - The detection with grab sampling requires successful timing.
- All triasulfuron concentrations remained <LOQ (10 ng L^{-1}) with grab sampling but it was found with passive sampling (Fig. 4).

Conclusions

- With passive sampling the time-weighted average concentrations of pesticides during two weeks sampling period can be determined.
- With passive sampling even the trace concentrations can be detected.
- Time of sampling determine if the pesticide is discovered with grab sampling.
- Even one passive sampling deployment can give representative picture of the pesticide concentrations in receiving waters.
- The highest peak concentrations are not expected to be found with passive sampling. On the other hand, they are not totally missed either, which would likely happen with grab sampling.

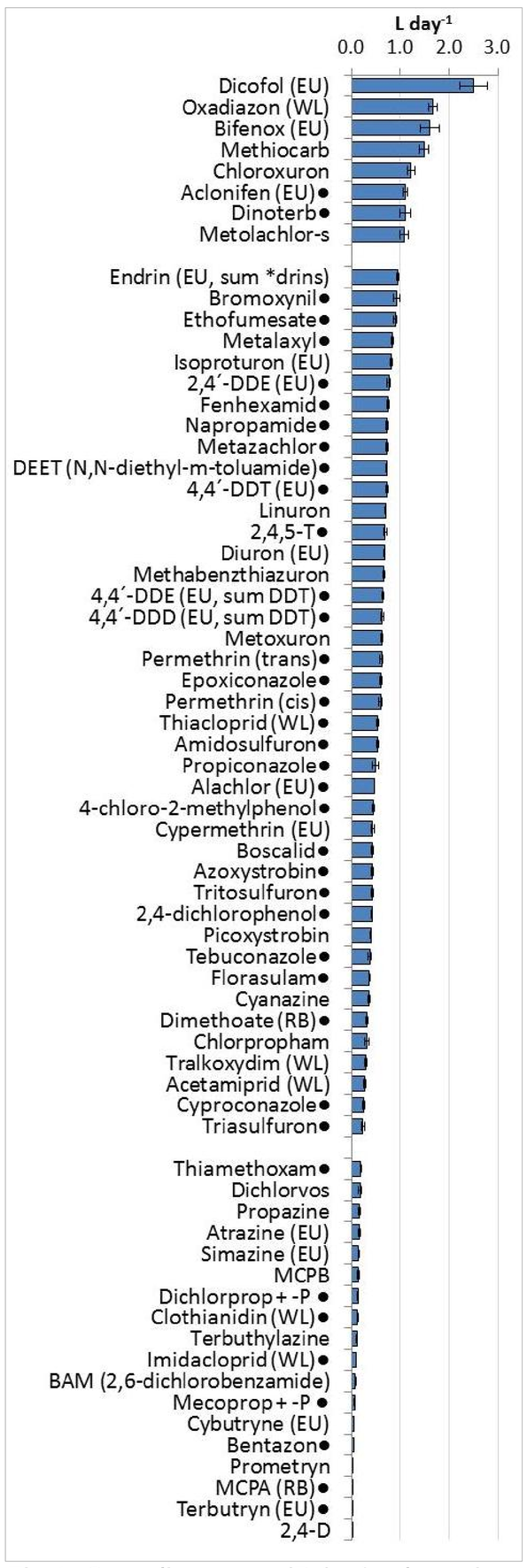


Fig 1. Sampling rates (R_S) of selected pesticides.
EU= Priority substance
WL= Watch list pollutant
RB= River basin chemical
● pesticide detected in river Savijoki

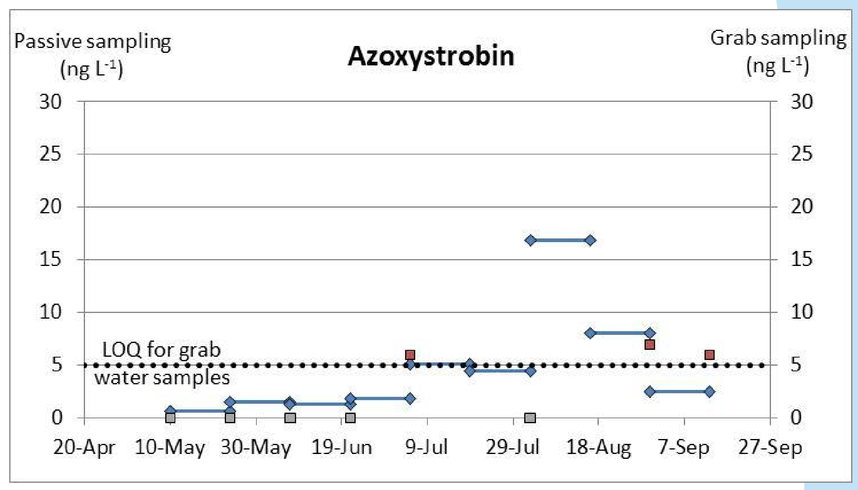


Fig 2. Azoxystrobin concentrations studied with passive and grab sampling. AA-EQS is 80 µg L^{-1} and Mac-QS is set to AA-EQS.

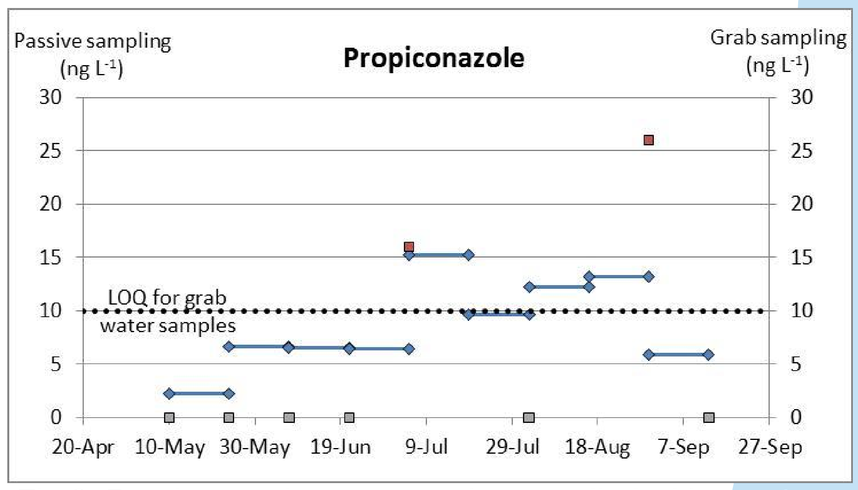


Fig 3. Propiconazole concentrations studied with passive and grab sampling. AA-EQS is 1.8 µg L^{-1} and Mac-QS 2.1 µg L^{-1}.

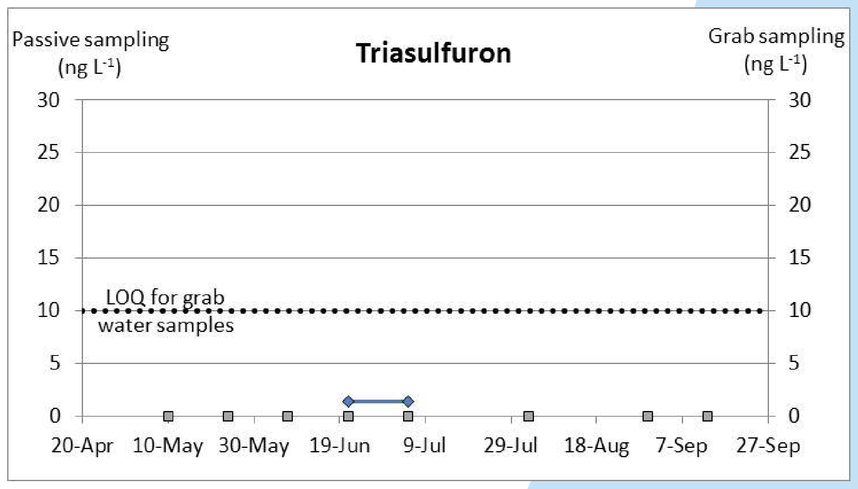


Fig 4. Triasulfuron concentrations studied with passive and grab sampling. Mac-QS is 7.3 ng L^{-1} and AA-EQS 1.8 ng L^{-1}.

References

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