Methodology for spatial analysis of pesticide residue monitoring data in surface water

General Objectives of the D.Lgs 150 - National Level

- Reduce pesticide risks and impacts on human health, environment and biodiversity.
- Promote application of integrated pest management, organic agriculture and other alternative approaches.
- Protect pesticide sprayers and farmers.
- Protect the consumers.
- Protect aquatic environment and drinking water.
- Preserve biodiversity and ecosystems.


Regional Characterization

The food farming system of the Region Lombardy is the most relevant at national level and one of the most important in the European context. The agro-business in Lombardy Region exceeds the 12.2 Billion of euros (15.6% of the National production); it involves almost 70000 productive structures with more than 245000 workers, over a territory of 5.8% of the EU-27 surface. The Regional Gross Domestic product represents 2.6% of the entire European Union.

Considering the structure of the food farming system and the productive vocation of the Lombardy Region, the adoption of D.lgs. n. 150 focuses in particular on, due to its coverage in the Lombardy landscape and to the strategic relevance in the zoonomic systems. Even due to the peculiarity of its way of cultivation and on its particular environment, Veneto, due to the high number of pesticide use, and to the economic importance and to the agricultural importance at regional level.

FOCUS on pesticide risk for surface water: approach

First screening of the potential qualitative pesticide risk for surface water was performed by comparing the MEC with the Environmental Quality Standard (annual average or maximum concentration) - EQS (Italian Regulation Limit - DM 260/2010) MEC/EQS

Materials
• The pesticide maximum concentration detected in SW was considered as the max Measured Environmental Concentration – MECsw.
• The pesticide annual average concentration detected in SW was considered as the max Averaged Measured Concentration – AMCsw.
• A collection of ecotoxicological data have been retrieved for all the monitored pesticides from the Active Substance report assessment study
• For each pesticide, PNEC has been derived from the ecotoxicological endpoint of the most sensitive specie divided by a safety factor.

Limits of the approach
• Surface water monitoring network is not specifically designed for pesticides, but for general purposes related to water quality
• The sampling frequency is scheduled to occur quarterly a year, it does not correspond to the best practice to proper detect pesticides in surface water
• The monitoring punctual data of pesticides in SW is a snap-shot of a situation that could over/under estimate an environmental pesticide pollution

To assess the pesticide risk to the aquatic ecosystem, the detected MECsw were compared with the Predicted No Effect Concentrations. MEC/PNEC value lower than 1 were considered situations to be addressed.

Results

Glyphosate: it represents the active substance with the greatest MEC/PNEC exceedance with high distribution also within urban areas (agricultural and extra-agricultural use).

Terbutylazine: the third active substance in terms of MEC/PNEC exceedance even if the residue concentrations show a descending trend.

Oxadiazon: the number of MEC/PNEC exceedance related to this substance shows an increasing trend, mostly connected to rice crop.

Conclusions

The complexity of the processes related to the pesticide use in the Lombardy Region needs to be accurately addressed.

Some of the pesticides detected in surface water are included constantly and more frequently into monitoring programs than others: often the monitored active substances do not correspond with the most hazardous substances for aquatic environment. Detailed, specific and fact finding assessments have to be a first essential action in the future monitoring plans together with a constant update in the monitoring programs

Specific recommendations were drawn
• Terbutylazine and Oxadiizon were detected once or more than once in the selected monitoring period with a ratio MECsw/PNEC greater than 1.
• Some insecticides can cause an alert to the environment even when their monitored concentration values are below the EQS of 0.1 µg/L.
• Metolachlor, not authorized anyone has to be substituted in the monitoring programs with S-metolachlor.

Glyphosate, even with acceptable MEC/PNEC ratios, results to be highly diffused over the Lombardy Region surface water network both in agricultural areas and in urban areas: mitigation is necessary

References

1. Corresponding Authors: [email protected], [email protected].
2. The food farming system of the Region Lombardy is the most relevant at national level and one of the most important in the European context. The agro-business in Lombardy Region exceeds the 12.2 Billion of euros (15.6% of the National production); it involves almost 70000 productive structures with more than 245000 workers, over a territory of 5.8% of the EU-27 surface. The Regional Gross Domestic product represents 2.6% of the entire European Union.
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Specific Objectives of DGR n. X/3233 – Regional Level

- Training and provision for users, distributors and consultants a certified control system, check and service of sprayers
- Support specific protection actions in high priority environmental areas and in protecting the aquatic environment
- Detection and source identification of illegal and ground water monitoring planning
- Promote low pesticide-input management including non-chemical methods
- Protection of Nature 2000 areas
- Increment the number of stations to collect agro-meteorological data
- Reduce pesticide product use in urban areas, streets and railroads
- Enhance the dissemination of agro-meteorological dispatches with correct treatment strategies
- Improve the knowledge of real pesticide load (in terms of kg or Liters) into the environment and reduce illegal pesticide products