

Managed aquifer recharge as environmental tool risk mitigation linked to the presence of herbicides.

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The pollution due to some herbicides which was used in flood plains and karst areas of various regions in the world is causing major problems in supplying drinking water from surface water bodies and aquifers.

Pesticides and herbicides are widely used in agriculture, vineyards, industry and public hygiene. They are spread on soil surface, in air, into deep soil causing problems in surface water bodies and aquifers. In Italy the interest of presence of pesticides in water resources began around 1980 after episodes of drinking water contamination due to some herbicides and atrazine (ATR). After years away from the ban on the use of atrazine (use prohibition in the 90's), its degradation products are still present in groundwater of large areas of the plains of Nord Italy (Bottoni et al., 2013).

Intensive use of triazines has become harmful for the local population that live in the Veneto-Friuli plain where the high gravels permeability of alluvial fans allowed to the widespread diffusion of triazines and related metabolites. The main mechanism of atrazine action in soil is microbial degradation, the kinetics of these products is closely connected with the availability of nitrates in the soil. The half-life of atrazine is 30-180 days but its disintegration is blocked by nitrates presence (Jones et al 1982). ATR is trapped in cohesive levels as peat and silty clay soils and periodically released by the interaction water sediment.

Artificial recharge in areas with highly permeable aquifers allows to realize qualitative and quantitative regeneration because water low in nitrates and Dissolved Oxygen can promote the biological and chemical disintegration of pesticides such as atrazine and its metabolites. A case study is represented by the Friuli plain, near the Tagliamento river. Based on the WARBO project data that has applied artificial recharge in Mereto di Tomba test site where the dissolved nitrate content of water in some cases exceed the 50 mg/L limit according to Italian legislation (DL 152/2006), is proposed to apply this methodology to deal drinking water supply problem that afflicts the fields wells of Pordenone city resources. The study conducted on city aqueduct waters have shown the presence of atrazine metabolite that exceeds 0.10 $\mu\text{g/l}$ referred by law limits (ISPRA Report 2015).

The release and infiltration of fresh water through the controlled charging reduces the concentration of nitrates promoting the degradation of atrazine metabolites.

Application of recharging methods could be a method the contamination reduction of ATR and herbicides with the recovery of water resource.

Bottoni P., Grenni P., Lucentini L., Barra Caracciolo A. 2013. Terbutylazine and other triazines in Italian water resources *Microchemical Journal* 107 136–142

Jones TW, Kemp WM, Stevenson JC, Means JC .1982. Degradation of atrazine in estuarine water/sediment systems and soils. *J Environ Qual* 11:632–638

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