

Fates of human enteric viruses after the discharge or reuse of treated wastewater

Wastewater reuse for agricultural irrigation as an alternative to wastewater dis-charge in river; environmental fate of human enteric viruses present in treated wastewater

ABSTRACT

The reuse of wastewater in agricultural irrigation adds a marginal water resource and avoids its polluting discharge into rivers. Of domestic origin, it contains human enteric viruses incriminated in epidemics transmitted by food, water and air. Optimising wastewater management requires comparing the risks of discharging it into rivers and recycling it.

Keywords : Agroecology, Agroecosystem, Pollution, Nutrition and health, Irrigation, Model, Soil, Value chain, Virus

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Project type : AAP

Research units in the network :

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Flagship project : no

Project leader : Pierre Renaud

Project leader's institution : INRA-INRAE

Project leader's RU : EMMAH

Budget allocated : 117000 €

Total budget allocated (including co-financing) : 117000 €

Funding : Labex

GOAL

The main objectives of the project are
to evaluate the viral contamination of Clermont-Community wastewater and of conventional water receiving it, and their impact on irrigated crops;
to evaluate the effect of the type of irrigation on the initial surface and internalised contamination of green onions by a model virus and on its subsequent fate
describe the processes affecting the fate of the same virus in the soil (immobilisation, inactivation, transfer).

The modelling should facilitate the transposition of the results to other contexts.

ACTION

Three work packages aim to address each of the three project objectives:

WP1: In situ monitoring of viral contamination of water, and spot assessment of the quality of irrigated crops;

WP2: Laboratory study of the fate of a model virus in the soil;

WP3: Characterisation of the impact of the type of irrigation on the contamination of green onions under

glass.

RESULTS

We have methods for (eluting,) concentrating and purifying viruses present in water or in plants, and their RNA/DNA from soil. We have defined devices/protocols to monitor their fate in situ after wastewater discharge or reuse, and under greenhouse irrigation;
in situ, the contamination of wastewater and conventional water seems to be in line with published data. Note the presence of viruses in the Allier's water table;
in greenhouses after irrigation, the initial contamination of green onions is significant. The type of irrigation affects surface contamination, not internalised contamination. Their subsequent abatement would result from washing by subsequent non-contaminating irrigation and transfer to the plant

PERSPECTIVES

WP1: Contaminations of irrigated crops by wastewater or conventional water. Data processing ;
WP2: To be carried out with more emphasis on soil inactivation (in view of the results of WP3);
WP3: Further characterisation of virus inactivation. Study of virus transfers in the plant ? Study of their adhesion to the surface ?