Emission to surface water from greenhouse spray applications

ERIK VAN OS and TYCHO VERMEULEN

Wageningen UR Greenhouse Horticulture,
P O Box 20, 2665 ZG Bleiswijk, The Netherlands

ABSTRACT

Emission from soilless cropping systems to surface water has recently become a great concern for water quality management. Interest was widely raised since a survey showed a strong correlation between too high levels of pesticides in surface water in The Netherlands and soilless cultivation (Riza, 2005). Further focus was given by the European Water Frame work Directive and the need for guidelines for the evaluation for pesticide authorisation in Europe on the aspect of emission. In 2008 a number of projects started to address these issues, including a Dutch working group aimed at unravelling the emission to surface water with the goal of creating an evaluation tool, a project aimed at developing strategies to reduce emission and a project aimed at purification at end of pipe level. This lead to a combined research effort along three lines: 1) understanding emission pathways and orders of magnitude of the emissions, 2) strategies and techniques to reduce emissions and 3) end of pipe techniques to purify the waste water.

The first line of research developed an evaluation tool consisting of a (modelled) approach for determining expected concentrations in surface water and a reference scenario per crop i.e. a description of an actual situation including the technical layout of the glasshouse, the climatological year and the receiving ditch. First runs with these models suggest that emissions of pesticides to surface water could be up to 16% and with poor management 23% of the applied dose, while emission to the air was found to be more than 7%. The model development in this research as well as the case descriptions could be used in authorisation procedures for pesticides within EU.

The second line of research focussed on techniques of UV-treatment and H_2O_2-dosage to prolong recirculation. These techniques were shown to ensure longer recirculation and as side effect purification of water from crop protection agents before discharge. However, the main reason for discharge – sodium accumulation in the recirculation water – is still not controlled. Sodium addition from water sources can be prevented using rain water and desalination techniques, though the economic implications have not yet been calculated. Sodium introduced via the commercially available nutrient mixtures and the cleansing products however seems more difficult to eradicate.

In the third line of research a number of end of pipe solutions are studied. Techniques studied include purification techniques, nutrient recovery, desalination and removal of organic molecules.

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