SIXTH FRAMEWORK
PROGRAMME

GM and non GM supply chains: Their CO-EXistence and TRAceability

Outcomes of Co-Extra

Mesoscale dispersal of maize pollen and implications for gene flow

Sylvain DUPONT, Yves BRUNET

INRA, Ephyse, Bordeaux, France

The growing introduction of genetically modified (GM) crops has generated a host of research efforts aimed at investigating the possibilities for coexistence between GM, conventional and organic farming systems. Published experimental and modelling studies aimed at characterizing pollen dispersal have shown that most pollen emitted by a source field deposits within a short distance from the latter, but also that the observed dispersal functions have long fat tails, making it possible for pollen to contaminate plants at rather long distances.

Such possibility has been recently confirmed from (i) a series of airborne measurements of maize and oilseed rape pollen concentration and viability in the atmospheric boundary layer, (ii) chamber measurements of pollen viability in a large range of temperature and humidity conditions and (iii) observations of fecundations in isolated plots of white-kernel maize, at several km from any maize field.

In order to better understand long-range dispersal of maize pollen an approach has been developed to simulate the trajectories and dehydration of pollen grains in the atmosphere at regional scale. To this purpose the non-hydrostatic mesoscale Meso-NH model has been modified so as to introduce source terms for pollen emission, conservation equations for pollen concentration and moisture, and a deposition velocity. Simulations have been performed over South-West France on several days during the maize pollination period. MesoNH is run in a two-way nested configuration including three nested computational domains down to a 2-km horizontal resolution. GIS-based landuse maps are used for the surface conditions, featuring all the maize fields of the region, as previously identified from satellite data. Considering several days during which airborne measurements were performed, observed and simulated concentration profiles are found to agree well throughout the atmospheric boundary layer. The simulations allow the pollen plume to be characterized through each day and deposition maps of viable pollen to be produced. The calculated deposition rates at remote distances from the maize fields are in the same range as those observed in situ. The results provide evidence that background fortitious contamination is unavoidable at regional scale. Additional test simulations will be performed using specific landuse patterns in order to quantify the impact of landscape structure on regional pollen deposition.