

Gone with the wind

Measurement of pesticides in the air in Vinschgau in 2018

Task

If pesticides are used in agriculture, they never end up in their target location one hundred percent. A part remains in the ground, reaches waters or is carried away through the air by wind and thermals. In orchards, characteristic for the landscape of the Vinschgau Valley in Italy's German speaking province South Tyrol, this transport of particles through the air is a particularly serious problem as the spraying isn't only done from top to bottom, but also sideways into the trees.

The aim of the study was to measure this effect to

- provide evidence that pesticide active substances are transported through air
- trace the spatial distribution of the various active substances
- trace the temporal distribution of the various active substances during one growing season.

Method

Two passive collectors (TE-200-PAS) produced by the company Tisch Environment were set up at each of the four locations with very different exposure scenarios and fitted with matching disks of polyurethane foam. The material is characterised by a large internal surface on which volatilised organic pollutants can adsorb.

This method was developed in the Canadian Ministry of Environment and has been used worldwide for many years, for example in the Global Atmospheric Passive Sampling Network. The use of the standardised collection medium enables a comparison between the pollution of the locations with an active substance when compared to each other and over a course of time.

The disks were purified in a laboratory before use to prevent pollutants from distorting the results. They were replaced every three weeks and sent to a laboratory for analysis in cooling boxes by express delivery. There they were extracted with methanol and the eluate was analysed for a total of 29 pesticide active substances that would probably be used in the region.

Locations

The four locations were selected in such a way that different levels of air pollution with pesticides could be expected due to different exposure scenarios. The specific locations were as follows:

- A) A garden within the closed village of Mals/Malles Venosta. The location is relatively well protected because the property is surrounded by a hedge and there are further buildings around the property. The location was selected to determine whether spray drift is detectable in built-up areas and at the edge of the fruit production core area.
- B) The second location was chosen as centrally as possible in an orchard in the central Vinschgau. The orchard is cultivated according to biological criteria, but is located in the immediate vicinity of conventional orchards.
- C) A third location was chosen remote from inhabited or cultivated areas above the valley floor in a side valley. The selected site is a slope near a stream course at the road from the village of Burgeis to Schlinig.
- D) Finally, a location was chosen where a lot of spray drift was to be expected without pesticides being used on the site itself. For this purpose, the two collectors were set up on a further organic farm in the central Vinschgau in such a way that air from the surroundings could very well flow into them.

Results

Further results are as follows:

- In the first measurement period from 23rd February to 16th March none of the 29 active substances was detected at any of the four locations.
- In the following eight measurement periods a total of 20 active substances was detected and up to 14 different substances were found in one sample at the same time.
- The more distant the site is from the conventional orchards, the lower the amount and number of active substances detected. The highest pollution could be found at site D, followed by B, A and C.
- Six active substances were detected at all four locations: fluazinam, captan, phosmet, chlorpyrifos-methyl, dithianon und imidacloprid. This indicates an intensive use and a significant potential of transport through air.
- Six further active substances are found at the three locations D, B and A: dodin, penconazole, cyprodinil, difenoconazole, thiacloprid and etofenprox. So they are even detectable in the air in the village of Mals in a fairly well protected environment.

Many of the pesticides that have been detected in the samples represent a significant threat to humans and the environment. Thus, for example

- captan is labeled with H351 (“suspected of causing cancer”) in the hazard classification of the EU Pesticides Database
- The insecticide thiacloprid, besides being suspected of causing cancer, is classified as “May damage fertility” and “May damage the unborn child” (H360FD) and is closely monitored by the EU Commission because it interferes with the human hormone system.
- imidacloprid is extremely toxic to bees and other insects. The median lethal dose for individual honeybees was stated to be 3.8 ng in the authorisation procedure.

Conclusion

- Overall, the results prove a significant transport of pesticides over distances of many kilometres up to remote side valleys.
- The results provide a clear indication of the difficult conditions for organic farms in the vicinity of intensive, conventional apple orchards.
- In addition, the results point out a risk aspect that has been underestimated up to now: Compared to individual active substances, the overall pollution with pesticides causes a significantly higher exposure that continues to exist over the course of the season and thus a correspondingly higher risk potential.