Pesticide Dermal Transfer through Contact with Sprayed Hard Surfaces to Operators & Agricultural Workers

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Study Principle & Objective

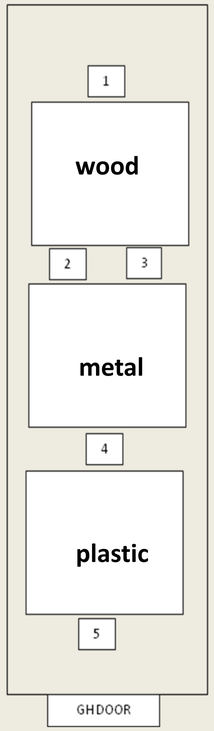
Hard surfaces in areas such as greenhouses and gardens or on pesticide application equipment are likely to be contaminated with pesticide residues during the application process. In order to investigate dermal transfer of pesticides from hard surfaces to pesticide operators and workers during agricultural activities through contact with contaminated hard surfaces, a field study based on a modified existing technique (Ramwell et al., 2006) was conducted in greenhouses at Tympaki region of Crete, Greece. The study principle was to simulate pressure contact with a gloved hand (either dry or moistened to simulate sweat on the hands or water on the crops from dew/concentration or rain) by loading a weight onto sampling matrices (dosimeters) in contact with a range of surfaces on which known amounts of pesticide formulation were applied. The dosimeters were analysed in the laboratory to measure the amount of pesticide retained in them and the respective results are presented and compared.

Method

Plastic, metal and wooden surfaces (1 m^2) were sprayed with an SC (suspension concentrate) formulation containing tebufenozide as active substance. Spraying was conducted inside a greenhouse (GH) with the surfaces placed on the inter-row corridor. Both dry and moistened cotton gloves were used in the trial. Pesticide loading on the gloves was achieved by replicated actions which involved static pressure produced by a metal plate (1.177 kg) that was inserted into each cotton glove with an addition weight placed on the glove (total of 8 kg on a surface area of 100 cm^2). The glove was left in contact with the sprayed surface for different contact durations (1, 3 and 5 times of repeated 10 second contacts, three replicates per contact case per matrix). The residues transferred onto the gloves were extracted with methanol and analysed with LC-MS spectrometry. Between the surface matrices cotton fabric dosimeters were placed to measure the pesticide deposition.

Photographs

a. Surface matrices placed in the GH
b. Metal surface after spraying with pesticide spray solution
c. Field personnel followed for loading the gloves
d. Schematic description of the placement of the three tested surfaces (wood, metal, plastic) and the five cotton dosimeters in the inter-row space of the greenhouse sprayed.

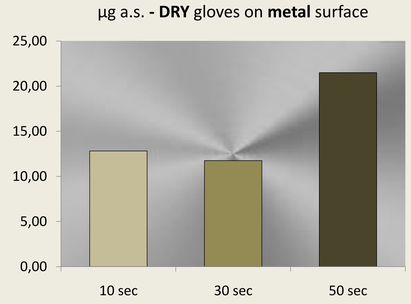


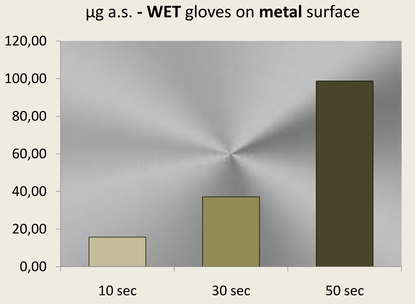
Results & Conclusions

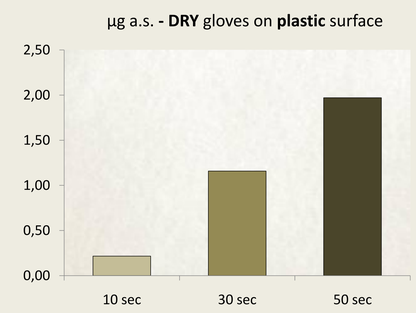
In all surfaces tested the amount of pesticide deposit transferred to the gloves increased with the duration of contact as expected. The increase in transferred deposit was not proportional to the total contact time or area in most cases, indicating that the increasing contact time and area did not contribute to the total transfer to the same extent as a single contact. The metal surface showed the greater transfer of pesticide deposit to the dosimeters. In general there was increased transfer of deposit with wet dosimeters compared to dry ones. The analysis of dosimeters placed between the different materials during the treatment was used to estimate the deposit (table below).

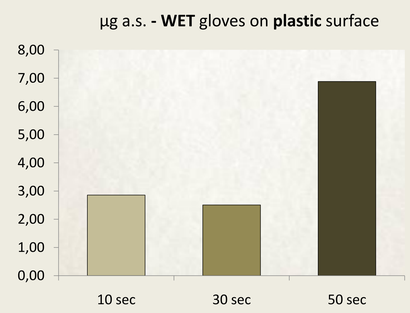
Material	State	Mean deposit on gloves (µg a.s. cm^2)	Mean transfer (% of pesticide deposit)
Wood	Wet	0.009	0.0007
	Dry	0.004	0.0003
Metal	Wet	0.157	0.0123
	Dry	0.128	0.0101
Plastic	Wet	0.029	0.0023
	Dry	0.003	0.0002

Initial data have been generated to indicate the amount of pesticide deposit transferred from three different surfaces when in contact with dry or moist gloves. The proportion of deposit transferred was generally low for all surfaces, approximately 0.01% for the metal surface, and lower by a factor of approximately 10 for the wood and plastic surfaces.









Reference
Ramwell *et al*. (2006) Transferability of Six Pesticides from Agricultural Sprayed Surfaces, *Ann. Occup. Hyg*., 40(3), 323-329.

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