Risk assessment of florists' exposure to insecticide residues during normal professional tasks

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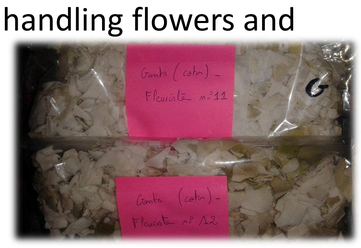
Introduction & objectives

❑ In Europe, as elsewhere in the world, floriculture are one of the most globally produced commercial mass production items , with a high growth potential and a major economic weight in international trade. As in any intensive culture, insecticide use is a significant strategy to fight against many pests (mainly mites and insects) which can damage production and marketability , so that ornamental producers can stay competitive in both national and international markets. The lack of maximum residue limits (MRL) for flowers means that there is no restriction on the use of pesticides, unlike other crops, which are harvested for consumption. This explains why imported cut flowers receive heavy pesticide applications prior to shipment. Many insecticides applied on flowers are persistent, dislodgeable by contact with the hands, and are fat-soluble. As they can easily be absorbed through skin contact, florists who handle the flowers daily and for several hours can potentially be exposed to residual deposits of pesticides and possibly endanger their health. [(1,2)]

❑ Research objective consist to assess the risk of potential dermal exposure to dislodgeable pesticide residues.

Materials & methods

Cotton gloves were distributed to florists (two pairs to each florist) and worn during two consecutive half days when handling flowers and preparing bouquets



The residual insecticide values were determined using a multi-residue (QuEChERS) method and a combination of gas chromatography and liquid chormatograhphy analysis

Calcul of potential dermal exposure (PDE)

PDE (in mg a.s./kg bw per day) = [(C [mg/kg] x GW [kg]) × T [h]) x 3] / bw [kg]
Where, C is the concentration of active substance in the sub-sample (5 g), GW is the average weight of the cotton gloves samples (**57 g**), T is the task duration during the trial (**2h**) and bw is the body weight (**60 kg**)

Results & discussions

- **Global Results of Analyses of Residual Deposits**

For 20 samples (two pairs of cotton gloves /sample)

- Total number of insecticides detected: **55**
- Average number of active substances/sample: **16 s.a**
- Average concentration per glove sample: **6.65 mg/kg**
- Active substance for wich the highest average concentration : **Novaluron (3.38mg/kg)**
- Active substance for wich the highest maximum concentration : **Clofentezine (18.37 mg/kg)**
- Most of the pesticides belong to the following chemical groups:
  - **Pyrethroids (8 a.s.);**
  - **Organophosphates (6 a.s.);**
  - **Benzolureas, carbamates, keto-Enol and neonicotinoids (4 a.s. each)**

**a.s. :active substance*

Table 1: Number of insecticide detected classified in each hazard category according to the CLP regulation

Class	Number of insecticide
Acute toxicity	44(65%)
Carcinogenicity	3(4%)
Serious eye irritation	1(1%)
Reproductive toxicity	2(3%)
Sensitisation of the respiratory tract or the skin	9(13%)
Skin irritation	1(1%)
Specific target organ toxicity (single exposure)	3(4%)
Specific target organ toxicity (repeated exposure)	5(7%)

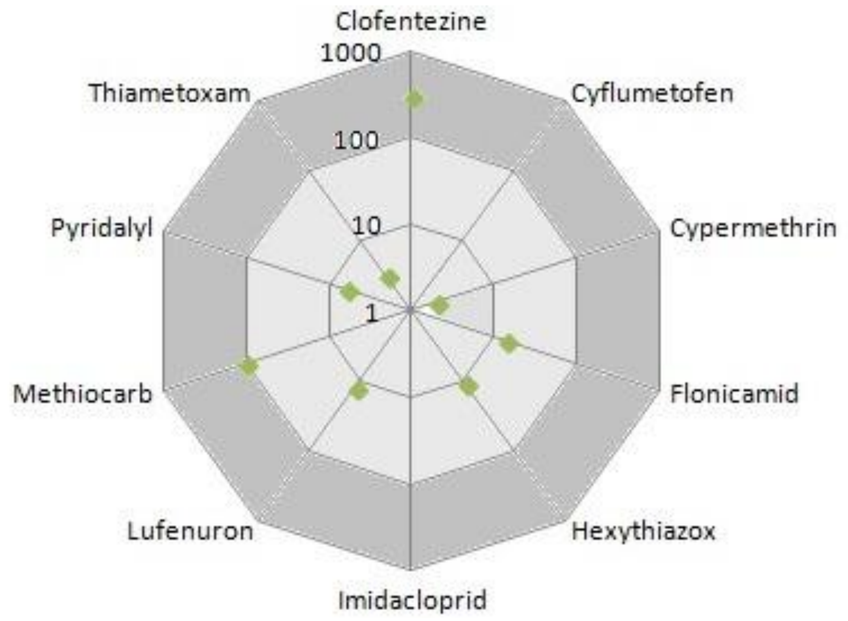


Figure 1 _ The PDE (90th Percentile) of the ten most frequently detected insecticide residues on gloves worn by florists in % of the AOEL

➢ The active substances detected are known for their toxicological properties (acute toxicity, with an action on the nervous system). Many of them may affect the skin of the florists after dermal exposure and 3 of 55 are suspected of causing cancer after prolonged or repeated exposure.

➢ **Clofentezine** was both the substance active for which the highest maximum concentration (18.37 mg/kg), the most detected insecticide and the substance active has a PDE the most critical.

➢ Among the ten insecticides most frequently detected on the gloves worn by florists, **clofentezine** and **methiocrab** exceeds the AOEL at the P90 level predictive.

Conclusions

Florists who handle a large number of flowers are exposed daily with a potential effect on their health. To reduce the exposure of florists to pesticide residues, solutions could be recommended: a better management of the pesticide used (ipm at the field or even organic flower production, a potential niche market); a stronger quality control of imported cut flowers and it could be interesting to set up a maximum residue limit for flowers to decrease the risk for professionals and all other people in contact with flowers. To better assess the risk, bio-monitoring of florists with analysis of their blood, urines and hairs are still to be investigated.

Reference

1. Toumi, K., Vleminckx, C., Van Loco, J. & Schiffers, B. (2016a). Pesticide residues on three cut flower species and potential exposure of florists in Belgium. International journal of environmental research and public health, 13 (10), 943.
2. Toumi, K., Vleminckx, C., Van Loco, J. & Schiffers, B. (2016b). A survey of pesticides residues in cut flowers from various countries. . Comm. Appl. Biol. Sci. Ghent University.

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