



## Results from the Danish monitoring programme for pesticide residues from the period 2004–2011



Mette Erecius Poulsen\*, Jens H. Andersen, Annette Petersen, Bodil H. Jensen

National Food Institute, Technical University of Denmark, Denmark

### ARTICLE INFO

#### Article history:

Received 1 September 2016  
Received in revised form  
14 November 2016  
Accepted 15 November 2016  
Available online 16 November 2016

#### Keywords:

Pesticide residues  
Monitoring programme  
Sampling plan  
Pesticide residue analysis  
Maximum residues levels

### ABSTRACT

The Danish pesticide residue monitoring programme evaluates compliance with the maximum residue levels established by the EU and monitors the residue levels in foods to enable an evaluation of the exposure of the Danish population to pesticides. The latter part of the programme included 25 different fruits, vegetables and cereals and processed foods. The commodities were chosen based on their contribution to the intake of pesticides in the Danish population. A total of 17,309 samples were collected during 2004–2011. The monitoring showed that the frequencies of pesticides were higher in samples of foreign origin than in samples of Danish origin both for samples with residues above or below the MRLs. Overall, pesticide residues were more frequently found in fruits and vegetables than the other groups of commodities; fruits had higher frequencies than vegetables. Residues above the MRLs were found in 2.6% of the samples. In plant commodities, 163 different substances were found in measurable concentrations. Residues of more than one pesticide (multiple residues) were found in 27% of all samples. A comparison of the frequencies of pesticide residues in commodities from different countries showed that Danish commodities with a lower frequency of pesticides.

© 2016 Elsevier Ltd. All rights reserved.

### 1. Introduction

Although food and health authorities worldwide ensure that the risk of exposure to pesticide residues in food is very limited for residues below the maximum residue limits, MRL ([EU - Pesticides database, 2016](#)), Danish consumers are in general very concerned about pesticide residues in foods. The focus of the Danish consumers is not explicitly on residues above the MRLs but on how often pesticides are found and how to avoid foods with pesticide residues.

Since the beginning of the 1960s, Denmark has monitored fruit and vegetables for pesticide residues. The Danish monitoring programme for foods was established in 1983. The results are reported for periods of 5–8 years. This paper covers the fifth period, 2004–2011. The programme included commodities of fruit, vegetable, cereal and animal origin.

The aim of the Danish monitoring programme is to evaluate compliance with the maximum residue levels established by the EU ([The European Parliament, 2005](#)) and to monitor the residue levels

in foods to enable an evaluation of the dietary exposure of the Danish population to pesticides ([Poulsen, Andersen, Petersen, & Hartkopp, 2005](#)).

This paper describes and compares in detail the 2004–2011 monitoring results to show the different factors that influence the exposure of the Danish population to pesticides. After describing the design of the monitoring programme, the sampling and analytical methods used are described, and a comparison of the frequency of samples with residues below and above MRLs between Danish, EU- and non-EU-produced commodities is shown, as well as the frequency of samples and commodity types with multiple residues. Additionally, the types of pesticides found in fruit, vegetables and cereals are listed. Finally, a detailed comparison of the frequencies of pesticide residues in commodities produced in different countries is presented. All residue data can be found in the [Appendix](#).

Although pesticide control programmes is implemented in many countries for many years, the amount of peer reviewed literature on results from pesticide residue monitoring in general is limited, since this type of data is usually published in reports and are often not in English language. Peer reviewed articles on food control results of pesticide residues covers typically only one commodity like honey, tomatoes, wine, citrus fruits ([Arias, Bojacá,](#)

\* Corresponding author.

E-mail address: [mpou@food.dtu.dk](mailto:mpou@food.dtu.dk) (M.E. Poulsen).

Ahumada, & Schrevels, 2014; Bargańska, Ślebioda, & Namieśnik, 2013; Juan-Borrás, Domenech, & Escriche, 2016; Ortelli, Edder, & Corvi, 2005; Rodríguez López, Ahumada, Díaz, & Guerrero, 2014; Uygun, Koksel, & Atli, 2005; Čuš, Česnik, Bolta, & Gregorčič, 2010), limited number of commodities e.g. fruits (Oliva, Gemal, Nóbrega, & Araújo, 2003), limited number of samples (Knežević & Serdar, 2009), or limited number of pesticides (Chen et al., 2011). Thus comparison of the overall results to other published data is primarily done against results from EU (EFSA, 2013, 2014) and USD (U.S. FDA, 2010; U.S. Food and Drug Administration, 2011).

The residue data presented here have been combined with Danish consumption data for different consumer groups, and dietary exposure calculations have been estimated and published in another paper by Jensen et al., 2015.

## 2. Materials and methods

### 2.1. Design of sampling plan

The sampling plan for the period 2004 to 2006 was structured in the same manner as for the period 1998–2003. A detailed description can be seen in Poulsen et al. (2005). In 2006, the design of the sampling plan was changed, and it has remained the same since then. The sampling plan for fruit and vegetables was drafted in two parts. The first part was designed to enable estimation of the exposure to pesticides and included 25 different fruits, vegetables and cereal commodities as well as processed foods such as wine. The commodities were chosen based on their contribution to the intake of pesticides in the Danish population calculated using the monitoring results from the period 1998–2003 (Poulsen et al., 2005). For these commodities, a fixed number of 50 samples per year were collected. Additionally, 15 samples of commodities referenced in the EU Multiannual Pesticide Control Programme (EU Commission, 2008) were included. Part two included samples that contributed less to the intake of pesticides but was focussed specifically on the compliance with MRLs or labelling of the production method, e.g., organically grown, produced without growth regulators or surface treatment. Part one comprised 70% fruit and vegetable samples and 15% cereal samples. The remaining 15% of the samples were of animal origin, including milk, honey, baby food and organic commodities. The results from these samples are not included in the comparisons, but all results are listed in the Appendix.

### 2.2. Samples

Authorised personnel from the regional food control units under the Danish Veterinary and Food Administration performed the sampling and collected the samples randomly within each commodity. The sampling procedure conformed to the EU directive on sampling for the official control of pesticide residues (EU Commission, 2002). The samples were mainly taken at wholesalers, importers, slaughterhouses and at food processing companies.

The sampling of meat and other products of animal origin is regulated by Council Directive 96/23/EC (EU Commission, 1996). The aim of this directive is to ensure that the Member States monitor primarily their own production of commodities of animal origin for different substances, e.g., pesticides. However, imported samples from non-EU countries shall also be monitored. Depending on the animal species, the number of samples was between 0.03 and 0.15% of the production or import.

The aim has been to monitor the commodities representative of the Danish market, and for this reason more samples produced in EU Member States and non-EU countries were collected than

samples of Danish origin. Thus, one-third of the plant origin samples were of Danish origin. For animal origin samples, more than 90% of the samples were of Danish origin as described by EU regulation 96/23 (EU Commission, 1996).

A total of 17,309 samples were collected over eight years. The number of fruit, vegetable and cereal samples increased, whereas the number of samples of animal origin decreased slightly during the period (see Fig. 1). Most of the samples were conventionally grown fresh fruits and vegetables (70%), but conventionally grown cereals (10%) and samples of animal origin (11%) were also collected. In addition, 6% samples of organically grown crops (fresh, frozen, processed) were collected, as well as processed foods (e.g., wine) and samples of baby food (see Table 1). Approximately 30% of the fruits, vegetables and cereals; 80% of the meat; and 100% of the milk were of Danish origin, whereas 99% of the wine was produced outside Denmark. Almost 175 different fruit, vegetable and cereal commodities were sampled; of these, 73 were also organically produced. Detailed results have been published each year in the period 2004–2011 (Jensen et al., 2011, 2012, 2010; Christensen, Petersen, Poulsen, Grossmann, & Holm, 2006; Danish Veterinary and Food Administration, 2005; Christensen et al., 2008, 2007; Petersen et al., 2009).

The number of samples was low compared directly with other EU countries. However, despite the low number of samples, Denmark was among the top four European Union (EU) Member States when comparing the number of samples taken related to the population size (EFSA, 2013). In 2010, Denmark collected 40 samples per 100,000 inhabitants. Only Iceland (86), Cyprus (84) and Slovenia (60) collected more samples than Denmark (EFSA, 2013). In 2010, the average number of monitoring samples per inhabitant in the EU was 14, and, for comparison, the number was 2.6 in the USA (U.S. FDA, 2010).

### 2.3. Analysis

The samples were mainly analysed at the Regional Food Laboratories. However, a few of the samples were analysed at the National Food Institute of the Technical University of Denmark. All laboratories involved in the monitoring were accredited to perform pesticide analysis in accordance to (International Standard Organization, 2005) by the Danish body of accreditation, DANAK.

Analytical methods were developed and documented at the National Food Institute of the Technical University of Denmark. Fruits and vegetables were analysed by up to five different analytical methods covering an increasing number of pesticides over the years, from 149 to 238 pesticides. Cereals were analysed by three different methods covering 105–166 pesticides, and meat

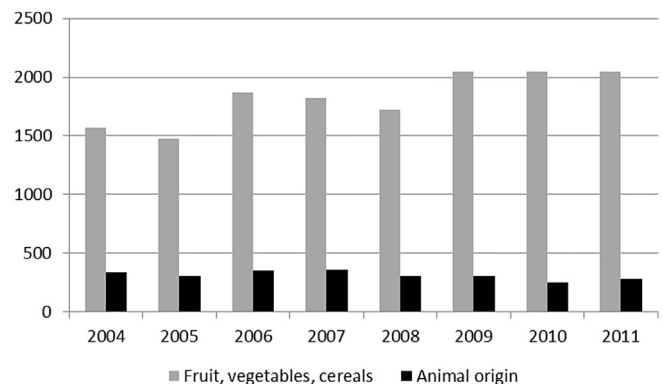


Fig. 1. Numbers of fruit, vegetables and cereal samples as well as samples of animal origin analysed during the period 2004–2011.

Download English Version:

<https://daneshyari.com/en/article/5767605>

Download Persian Version:

<https://daneshyari.com/article/5767605>

[Daneshyari.com](https://daneshyari.com)