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What are pesticides and why are they used?

Pesticides, also named plant protection products, are substances used to fight against pests, such as weeds, diseases, fungi or insects that destroy crops. Plants, like all living organisms, themselves produce natural substances as pesticides. These protections, not able to cope with the attack of some parasites, are supplemented by plant protection products. These pesticides act by confusing insects by making crops less palatable for pests or, more commonly, by killing the harmful insects, weeds and fungi through the use of chemicals. In this way, appropriate treatment can preserve the quality of crops and extend their shelf life.

Without plant protection products, the price of everyday foods would be higher and there would be lower yields because of losses from pests. It has been estimated that globally even with modern agricultural chemicals, pests account for pre-harvest crop losses of more than 40% of the potential value of output, with 15% attributable to insects and 13% each to weeds and pathogens. An additional 10% of the potential value is lost post-harvest.¹

How are plant protection products approved?

In the EU no plant protection product can be placed on the market and used unless it has first been scientifically established that it has no harmful effects on consumers, farmers, local residents and bystanders, that it does not provoke unacceptable effects on the environment and that it is sufficiently effective against pests.

All crop protection products must undergo a rigorous approval process before they are authorised for marketing and use. Risks are thoroughly assessed on the basis of extensive data covering product efficacy, product chemistry, human health and environmental impact. In an ambitious work programme launched in 1993, the European Commission started a Community-wide review process for all active ingredients used in plant protection products within the European Union. From the end of 2003, the European Food Safety Authority deals with risk assessment issues and the European Commission is responsible for the risk management decision.

A new regulation (Regulation (EC) No 1107/2009) entering into force in 2011 specifies even stricter criteria and ensures that carcinogens, mutagens, endocrine disruptors, substances toxic for reproduction or which are very persistent will not be approved, unless exposure to humans is negligible. It also introduces a substitution mechanism promoting safer alternatives.

What about minor uses and the availability of plant protection products?

A large number of crops, primarily fruit and vegetables, grown in Europe that are of major importance for the food industry and consumers are relatively minor in scale of production and also in their use of crop protection products when compared to the total agricultural production. While the magnitude of pest problems faced in these

¹ Orke E. C., Dehne H. W., Schonbeck F., Weber A. (1994): Crop production and crop protection: Estimated losses in major food and cash crops.

crops is similar to major crops, many newer and more efficient plant protection solutions are often unavailable to farmers and the food chain operators, mostly for economic reasons.

A recent study of the French research institute CTIFL (Centre Technique Interprofessionnel des Fruits et Légumes) revealed the present situation of minor uses in France. All important fruit and vegetable crops are coping with unprovided use (no crop protection solution) or critical use (1-2 crop protection solutions, risk of resistance). Given the fruit and vegetable category accounts for approximately 300 crops, the situation is even worse for smaller crops such as most berries or vegetables such as asparagus and radish. The increasing lack of economically viable crop protection solutions has huge economic consequences for growers confronted with lower productivity and less quality, but also raises concerns for Integrated Pest Management with an increased danger of disease or pest resistance developing.

A lot of work has been carried out in EU Member States to find and encourage viable crop protection solutions for all these situations, however these efforts remain modest compared to the magnitude of the problem.

Why are residues occurring?

Using plant protection products at the time and in the strength needed to be effective can sometimes leave traces on the final crop. The maximum level allowed has been carefully assessed to ensure that there is no health risk for consumers.

What are maximum residue levels (MRLs)?

A maximum residue level (MRL) is the highest level of a pesticide residue that is legally tolerated in or on food or feed. The amounts of residues found in food must be safe for consumers and must be as low as possible. MRLs are set by independent regulatory authorities, including the European Commission and the European Food Safety Authority (EFSA), using very wide safety margins. When residues occur in food, they usually occur at very low levels and well within the established MRLs. A residue found at or below the MRL indicates that the farmer or grower has followed requirements and used the compound properly. This is sometimes referred to as following 'good agricultural practice'. In fact, the main purpose of MRLs is to enable exporting countries to trade in crops internationally and assure importing countries that the crops have been treated correctly in the country of origin.

MRLs are thus trading standards and not safety standards. However, all MRLs are set within the acceptable degree of risk derived from the Acceptable Daily Intake (ADI)² and the Acute Reference Dose (ARfD)³ taking into account the chronic and acute toxicity. The risks for consumers associated with residues depend on the level of the residues in the food, the amount of the food actually eaten and the acceptable daily intake of each crop protection product.

² The Acceptable Daily Intake (ADI) is a health based standard for long term (chronic) exposure and is defined as an "estimate of the amount of a substance in food, expressed as on a body mass index, which can be ingested daily over a lifetime by humans without appreciable health".

³ The Acute Reference Dose (ARfD) is a health based standard for short term (acute) exposure and indicates the highest amount of a substance which may be ingested by humans in one day without causing any harm.

How are MRLs controlled and enforced?

Farmers, traders and importers are responsible for food safety, which includes compliance with MRLs. Food chain operators are committed to ensure compliance through due diligence and various control schemes. Member States' authorities are responsible for control and enforcement of MRLs. To ensure that this is done in an adequate and uniform way, the EU has three instruments:

- The co-ordinated EU multi-annual control programme sets out for each Member State the main pesticide-crop combinations to monitor and the minimum number of samples to take. Member States have to report the results, which are published in an annual report.
- Community Reference Laboratories co-ordinate, train staff, develop methods of analysis and organise tests to evaluate the skills of the different national control laboratories.
- The Food and Veterinary Office carries out inspections in the Member States to assess and audit their control activities.

If pesticide residues are found at a level of concern for consumers, the EU Rapid Alert System for Food and Feed (RASFF) circulates the information and measures are taken to protect the consumer.

If residues exceed the MRL, is the food still safe?

Very occasionally, pesticide residues are detected at levels above the MRL although it is extremely unlikely that they would ever pose an immediate health risk if the food was eaten. When a residue above the MRL is found, Member State authorities undertake an initial investigation to determine the significance of the breach. In the rare event that a real health concern is identified, immediate steps to prevent the placing on the market of the crop should be taken. In the more common scenario where an MRL is exceeded but there is no health concern, measures should be put in place to ensure that no repetition occurs and that farmers are informed and educated to avoid future MRL exceedance. Further legal proceedings can be initiated if non-compliance persists. Even in the unlikely event that a person did buy food that was above the MRL, the normal processes of storage (reduction over time), washing and cooking the food will, in most cases, significantly reduce the levels of residues for the majority of compounds. The extent of any health risk would depend on how much residue was found, in how many foods it was found, and how much of that food a person would be likely to eat.

What are the reasons for MRL-exceedance?

Whilst all operators in the food chain are committed to avoid placing on the market a produce exceeding the MRL, MRLs can sometimes be exceeded involving different reasons:

- A crop may be correctly and responsibly produced according to good agricultural practices (GAP) in one country, but be sold in a country which has a different GAP and MRL in place. Different climatic and pest pressure conditions may require different GAPs which result in different MRLs.
- The lack of registered pesticides: a particular problem for fruit and vegetables often considered as minor uses.
- The occurrence of unusual crop conditions or climatic conditions may lead to slightly higher levels of residues remaining regardless of compliance with GAP or label instructions.
- Crops may not have been treated according to GAP, i.e. the PPP is not used according to the instructions on the label, or some other inappropriate use has taken place (note: in many cases strict food chain quality assurance schemes would ensure that such practices would normally be identified, and steps be

taken to rectify the situation, such as choosing not to purchase a particular consignment of produce, before the produce reaches the final consumer).

- False positives may be reported by monitoring bodies, especially in cases where MRLs are set at the “default low level” of 0.01 mg/kg.

What about multiple residues?

When a farmer's crop is attacked by several different pests and diseases, he may need to use several different plant protection products to prevent damage to his crop. This is why the results of residue monitoring sometimes indicate that some of the samples tested contain residues of more than one plant protection product. Besides this, the same product is not used on a particular crop, 100% of the time, and our diets are normally quite varied. Therefore we are more likely to get little doses of residues from many different foods.

Whether one eats a lot of different foods containing the same compound or whether you eat a meal containing several different compounds, the health implication is the same – any effects would depend on the level of residue in the food and the amount you eat. A substantial amount of research has been conducted into what some call the ‘cocktail effect’ and international experts agree that it is rare. Testing to date has shown that consuming a mix of chemicals at the levels found in foods is of no more concern than consuming each chemical individually.

It's impossible to carry out tests on all combinations of the few hundred chemicals used in food production but, in the myriad of tests that have been done, there is little evidence of the ‘cocktail effect’. Almost no agricultural compounds interact with each other. This means you can consume residues of many different compounds without any health effect, providing the residues are below the respective ADIs.

Is it dangerous for my health to eat fruit and vegetables treated with pesticides?

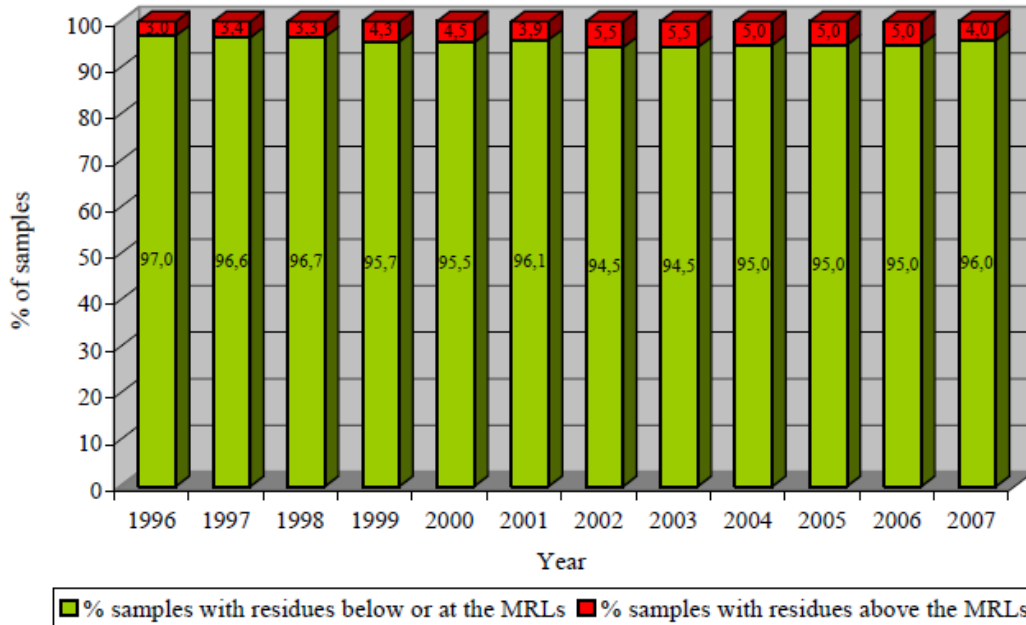
The established rules guarantee the consumers the healthiness of fruit and vegetables they buy, whether treated or not. These rules are defined from toxicological studies and data on consumption of the population. The safety margins adopted in setting these thresholds are such that someone would have to eat every day of his life and in an excessive amount fruit and vegetables which would have a hundred times the maximum residue limits permitted. This seems unlikely. Moreover, there are no scientific studies to date which show a link between the presence of multiple residues and a risk to health.

Is the use of pesticides dangerous for the health of professionals who have to handle them?

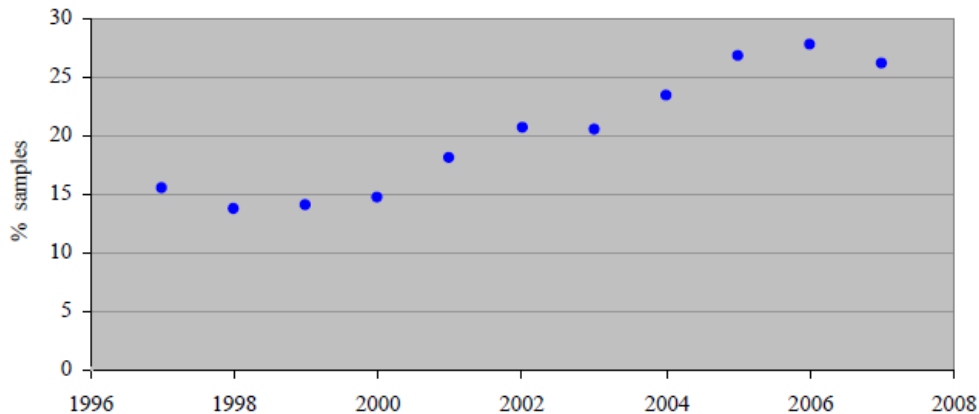
When concerning health, one should not separate between operators and consumers. People who handle pesticides and are in direct contact with the active concentrate used for the treatment of cultures must protect themselves and limit their exposure to avoid the risk from pesticides. The handling and use of pesticides requires, like all chemicals, compliance with precautionary measures to limit the toxic hazard potential.

What are the results of the monitoring efforts?

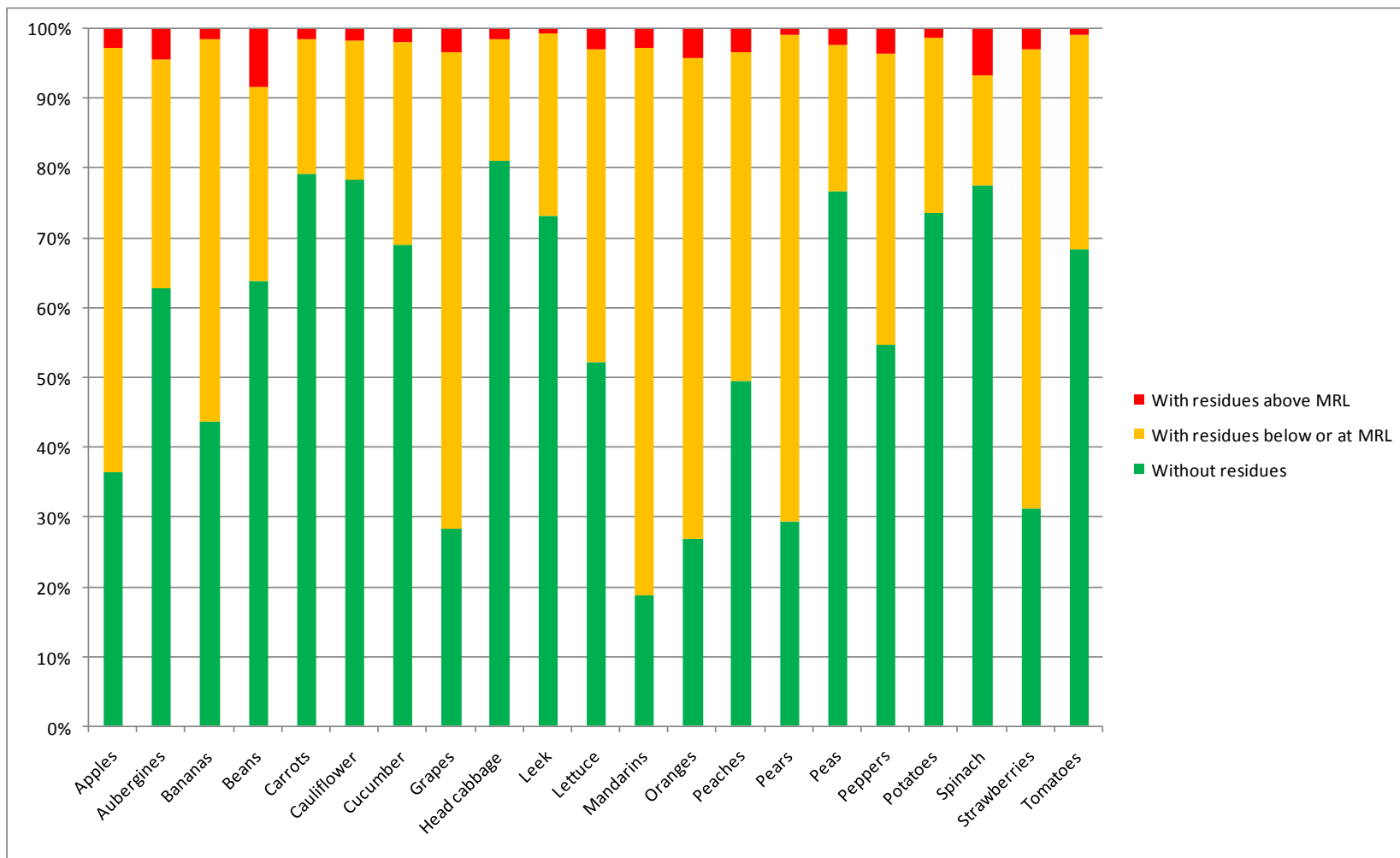
The European Food Safety Authority (EFSA) publishes an Annual Report on Pesticide Residues, which provides an overview on the pesticide residues in food observed throughout the EU and assesses the exposure of consumers through their diets. The recent report, published in July 2009, shows that the majority of the samples complied with the legal MRLs. The report says that 96% of the samples analysed were compliant with the legal MRLs and 4% exceeded them, compared to 5% in 2006. In total, more than 60.000 samples were analysed for pesticide residues in 2007, representing a 10 % increase in comparison with 2006. Considerable efforts were made by Member States in extending the scope of the analytical methods, which made it possible to detect up to 870 pesticides in 2007, an increase of 13 % compared to previous years.



Monitoring results 1996-2007 for fruit, vegetables and cereals and baby food (excluding processed products): percentage of samples with residues compliant and non-compliant with MRLs (EFSA Annual Report on Pesticide Residues 2007).



Percentage of samples with multiple residues from 1997 to 2007 in fruit, vegetables and cereals (EFSA Annual Report on Pesticide Residues 2007).



Percentage of samples without residues, with residues at or below the MRL and with residues above the MRL for the fruit and vegetables in the EU coordinated monitoring programme (EFSA Annual Report on Pesticide Residues 2007 and FVO report 2005 and 2006).

What about organic fruit and vegetables and pesticides?

Organic fruit and vegetables are produced according to regulated production standards which among others do not allow the use of synthetic pesticides. However, contrary to popular belief, organic production has an array of non-synthetic pesticides at its disposal, but these should only be used as a last resort.

Choosing a fruit or vegetable treated or not with synthetic pesticides is a choice for a mode of production and not for better food safety. As no specific MRLs for organic products are established at EU level, the same MRLs as for conventional products apply for them. The EFSA report shows that in general samples of organic fruit and vegetables have a lower rate of MRL-exceedance (overall 1.09% of samples) in comparison to conventionally grown fruit and vegetables (4.19% of the total surveillance samples).

What about integrated pest management and integrated farming?

Many definitions of IPM exist. However, the following most common definition has been agreed by the UN's Food and Agricultural Organisation (FAO), and is supported by NGOs, the plant protection industry, and the International Farmers Organization. This definition is also reflected in the European Directive on the Sustainable Use of Pesticides.

*"Integrated Pest Management (IPM) means the careful consideration of all available pest control methods and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimise risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro ecosystems and encourages natural pest control mechanisms."*⁴

IPM is a key element of the broader concept of Integrated Crop Management (ICM) which in turn is a vital component of Integrated Farming, all of which need to be handled and adapted according to the site and situation. Integrated Farming considers the broader situation than just one individual crop and one crop protection measure employed at any one time. The emphasis of Integrated Farming/ICM is on a system that meets the requirements of long-term sustainability. It is a 'whole farm approach', which involves managing crops profitably with respect for the environment, in ways which suit local conditions.

What is the sector doing?

The fruit and vegetables sector has been proactive in developing sustainable agricultural practices to cope with increased requirements from consumers. This has been most notable in the uptake of integrated pest management schemes and is continuing through increased research efforts in lowering pesticide residues even below the limit of detection.

Residue-free produce, in the sense of not being detectable, will however not be available in all product ranges for some years to come and even then will still occasionally necessitate the application of plant protection products. Indeed the yield of agricultural and horticultural crops can be severely reduced as a result of infestation by pests and diseases and while the situation varies regionally, plant protection products will remain necessary to protect crops before and after harvest.

⁴ Internal Code of Conduct on the Distribution and Use of pesticides, FAO, November 2002.

What role do NGOs play?

Despite increased efforts of the sector to ensure MRL-compliance, NGO-campaigns have challenged during recent years legislation and certain industry practices, and pushed retailers to adopt further requirements with regard to pesticide use and residues. Suppliers have increasingly been confronted with additional requirements imposed by retailers which often go beyond the legislative requirements. This way, secondary standards are being established through non-regulatory MRLs and black lists (e.g. non-regulatory MRLs in Germany and the Netherlands or lists of banned substances in the UK). This is bringing new challenges and is introducing rules which are increasingly hard to cope with and which cancel out the positive effects of EU MRL harmonisation. The lack of harmonisation remains a major concern and a point of confusion within the chain. It could also be lamented that food safety appears to have become an instrument of competition between retailers when it should be a prerequisite.

Where can information be found?

More information is available from the websites of the following organisations:

EU Commission: http://ec.europa.eu/food/plant/protection/index_en.htm

EU Pesticides Database: http://ec.europa.eu/sanco_pesticides/public/index.cfm

European Food Safety Authority (EFSA): www.efsa.europa.eu

Fresh Quality Guide: <http://www.freshquality.org/>

Pesticide Information: <http://www.pesticideinformation.eu/>

Pesticide Action Network Europe: <http://www.pan-europe.info/>

What is the relevant EU legislation?

Council Directive 91/414/EEC of 15 July 1991 concerning the **placing of plant protection products on the market**

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0414:EN:NOT>

Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the **placing of plant protection products on the market** and repealing Council Directives 79/117/EEC and 91/414/EEC (**entering into force in 2011**)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009R1107:EN:NOT>

Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 **on maximum residue levels of pesticides** in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC (Text with EEA relevance)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005R0396:EN:NOT>

Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to **achieve the sustainable use of pesticides** (Text with EEA relevance)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0128:EN:NOT>

Commission Directive 2002/63/EC of 11 July 2002 establishing Community **methods of sampling for the official control of pesticide residues** in and on products of plant and animal origin and repealing Directive 79/700/EEC (Text with EEA relevance)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:187:0030:0043:EN:PDF>
