PAN Germany

Pesticides in Central and Eastern European Countries

Usage, Registration, Identification and Evaluation

Part 2: Hungary

Hamburg, 2003

Pesticide Action Network

Founded in 1982, Pesticide Action Network is an international coalition of over 400 citizen groups in more than 60 countries working to oppose the misuse of pesticides and to promote sustainable agriculture and ecologically sound pest management.

PAN Germany was founded in 1984 and strives to reduce impacts of pesticide use on national, european and international level.

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1 Introduction

Pesticide use in EU accession countries has been very low for over a decade, but is on the rise again. The accession of Hungary into the European Union will most likely intensify agriculture. There is much fear that traditional ways of farming will be replaced by industrial farming system with a high dependency on agrochemical usage with all their negative side effects.

In order to meet the challenges of the EU accession the capacities of Central and Eastern European NGOs need to be raised. NGOs need knowledge about pesticide hazards and the current discussion and activities regarding pesticide policy in the EU. For this purpose PAN Germany has started a CEEC project. This publication is one part of the project and aims at information dissemination on agriculture and pesticides to NGOs in Hungary.

PAN Germanys' Publications:

This brochure is one in a series of similar publications about pesticides in **Hungary, Poland, Slovenia** and the **Czech Republic.**

These four publications focus on the evaluation of authorised pesticides regarding their human and environmental toxicity.

More information on pesticide regulation in the European Union and a critical review can be found the PAN Germanys' **Pesticide Action Handbook**, which is written for NGOs in CEEC countries.

Separate publications on the **PIC** and **POPs Convention** were published by PAN Germany in English, German and Russian.

2 Goals

This study has got the following goals:

- to give an overview about agriculture and on pesticide use in Hungary
- to characterise the pesticide active ingredients authorized in Hungary by use type and chemical class;
- to reflect their regulatory status in the European Union and globally;
- to evaluate the pesticide active ingredients regarding their human and environmental toxicity,
- to determine their potential as water and food contaminants, and
- to list regulations addressing pesticides.

Boxes in this report:

This report can only cover up the most relevant aspects about pesticides. The world wide web offers a tremendous amount of information on individual pesticides, their regulation and their toxicity. In order to guide the interested reader we listed and commented particularly helpful websites.

Readers, who read this text as Acrobat pdf file are able to access the cited websites via Internet Explorer or Netscape Communicator by clicking on the URL.

3 Hungarys' Agriculture

Farming in Hungary is characterised by a large number of small and very small farms on the one side, and a small number of middle and large farms on the other side. Almost 95% of the farmers cultivate less than 10 hectare. These 900.000 farmers cultivate some 35% of the total agricultural area. This means that the other 5% of the farmers cultivate 65% of the agricultural land. Table 1 shows the distribution of farms by number of holding and by hectare.

Table 1: Distribution of Farmland and Number of Holdings in 2000

Size	Number of holdings	% of total number of holdings	Hectare	% of ha	Average size in ha
<10 ha	908.595	94,79	890.590	34,07	0,98
10-50 ha	42.846	4,47	916.730	35,07	21,4
50-100 ha	4.601	0,48	324.920	12,43	70,62
100-300 ha	2.205	0,23	360.209	13,78	163,36
< 300 ha	287	0,03	121.551	4,65	423,52
Total	**958.534**	**100**	**2.614.000**	**100**	**2,73**
Other privately cultivated agricultural households	835.617		1.367.000		

Source: Central Statistic Office, General Agricultural Census, 2000 (Farm: household with some agricultural activity, as defined in the Hungarian Law on Statistics)[1]

The favourable climatic and soil conditions allows to cultivate a higher diversity of arable crops, fruits and vegetables. The arable land in Hungary accounts for about 4.711.000ha. 65% of the arable land area is cultivated with grain crops, whereas wheat is the most cultivated crop. Second most cultivated crop is corn. Table 2 shows the acreage of the largest arable crops in Hungary in 1997.

Table 2: Major Arable Crop Grown in Hungary in 1997

Arable Crop	Hectare
Wheat	1.200.000
Corn	1.059.000
Sunflower	444.000
Barley	370.000
Lucerne hay	233.000
Sugar beet	98.000
Rye	67.000
Potatoes	64.000

Source: Ministry of Agriculture and Regional Development

1 Presentation by Dr. Vajda, Ministry of Agriculture and Regional Developement Hungary

Hungary has always been a producer of fruit, wine/grapes and vegetables. The largest vegetable growing areas are located between the rivers Danube and Tisza, in the South, and in the north-eastern part of the Great Hungarian Plain. Table 3 shows that green peas and tomatoes are the major vegetables, and apples and plums are the major fruit.

Table 3: Fruits and Vegetable Grown in Hungary in 1997

Crop	Hectare	Tons Production
Vegetables	**120.000**	
Green peas	17.507	
Tomatoes	13.710	
Green peppers	10.591	
Cabbages	6.998	
Onions	64.14	
Red pepper	5.655	
Fruits	**96.000**	
apple	-	500.000
pears	-	37.000
sour cherries	-	65.000
plums	-	123.000
apricots	-	25.000
peaches	-	54.000
Vineyards	**99.000**	717.000

Source: Ministry of Agriculture and Regional Development

Table 4 shows the number of farm animals in Hungary in 1997. According to the Ministry of Agriculture the number of cattle has declinds since the 1980ties, but the production of poultry (chicken and fowl) is constantly increasing, comparable to the rate of the world production. Due to subsidies the number of sheep has increased in Hungary, too.

Table 4: Number of Animals in Hungary in 1997

Animal	Number
Cattle	871.000
Dairy cows	403.000
Pig	4.931.000
Sheep	858.000
Chicken and fowl	30.983.000

Source: Ministry of Agriculture and Regional Development

Hungary mostly exports high quality cattle, wine and wheat. The country is a net-exporter of agricultural products, with a positive trade balance in 2001 of about € 1.567 Million. The share of agricultural production on the Gross Domestic Production, was about 4,5% in 2001 or about one third of the 12,6% in 1990.[2] This does, however, not reflect a decrease in trade with agricultural products, but rather a positive trend in the development of sectors outside agriculture.

4 Agri-Environment Programme

In January 2004 Hungary will join the European Union as a full member. The European Union implemented three re-accession support instruments. SAPARD 'Special Accession Programme for Agricultural and Rural Development, which relates to support for agriculture and rural development; ISPA – a large capital investments in the environment and transport sectors, and PHARE – integrated regional development. Upon accession to the EU, SAPARD will cease to exist and will instead be replaced by the Rural Development Regulation. The three main priorities of the general strategy of the SAPARD plan are the following ones:

- to increase the competitiveness of Hungarian agriculture
- to emphasise the objectives of environmental protection
- to help the adaptation ability of rural regions

Table 5 shows the expenditure for planned measure for the years 2000-2006.

Table 5: Projected expenditure by measure for the years 2000-2006 (Euro)

	Total public expenditure	EU support	EU fund (%)
Investments in agricultural holdings	100.809.333	75.607.000	28,50%
Processing and marketing of agricultural and fishery products	72.722.667	54.542.000	20,50%
Improvement of vocational training	6.330.667	4.748.000	1,80%
Agricultural production methods designed to protect the environment and maintain the countryside	15.106.667	11.330.000	4,30%
Setting up producer groups	26.040.000	19.530.000	7,40%
Renovation and development of villages and the protection and conservation of natural heritage	32.093.333	24.070.000	9,10%
Development and diversification of economic activities, providing for multiple activities and alternative income	54.769.333	41.077.000	15,50%
Development and improvement of rural infrastructure	42.438.667	31.829.000	12,00%
Technical assistance, studies to assist preparation and monitoring, information and publicity campaigns	3.847.175	2.885.381	1,10%
Total	354.157.841	265.618.381	100,00%

The item 'Agricultural production methods designed to protect the environment and maintain the countryside' relates to agri-environment programme. Five more detailed aspects of the agri-environment programme were outlined:

- wide scale introduction of environmentally friendly agricultural production methods, achieving through this the sector level realisation of environmental targets, and the preservation and improvement of our natural values, and the quality of the countryside, the soil and the water resources;

2 ibid 1

- contribution to the establishment of a sustainable agricultural land use, a rational system of area utilisation, and a balanced and stable land use and production structure, that is adapted to the agri-ecological potential of Hungary; increasing the production of competitive, high quality, valuable products hereby improving the possibilities for the agricultural export;
- diversifying the rural employment and income earning opportunities, contribution to the improvement of rural life, establishing alternative income earning opportunities;
- improving and utilisation of the tourism potential, primarily through improving the look of the countryside and the landscapes, and the conditions for ecotourism and rural tourism;
- contribution to the success of other rural development measures, to the production environmental education of the rural population and the producers and to the changing of attitudes.

Based on the above objectives five program directions were developed in the agri-environmental part of the SAPARD plan:

- organic arable land farming,
- extensive grassland,
- organic or integrated orchards and vineyard farming,
- wetlands,
- demonstration farm package,

The following subsidies are planned: organic arable land farming, € 75/ha; extensive grassland, €28 ha; organic or integrated orchard/vineyard farming, €166/ha, wetland, €82/ha; demonstration farm, max. €31.300 per farm.[3] [4]

5 Organic Agriculture

Organic agriculture in Hungary goes back to the 1980ties and has always been export oriented. About 95% per cent of the organic products are exported. While in the 1980ties Holland was the main importer of Hungarian organic products, most organic products are now sold to Germany and Austria (see Table 6).

Table 6: Share of Exported Organic Products by Country (1999)

Country	Share of export in Percent
Germany	40
Austria	25
Switzerland	20
Holland	10
Others (U.S.A., Scandinavia)	5

3 John Powell, SAPARD EU Pre-Accession Adviser (2000): General Review of the Purpose and Role of SAPARD

4 Szabó, G., Balázs, K.; Podmaniczky; L., (2000): Agri-environmental Policies in Order to Manage Land Use in Environmentally Fragile Areas, Dévaványa case study area, Debrecen-Gödöllo

The overall export volume in 1999 was estimated at 15.4 million Euro. Table 7 shows the enormous increase in organic agriculture by both, farm numbers, and area between 1988-2000.

The association Biokultúra Egyesület founded in 1987, which is accredited by IFOAM is the officially registered organisation for the certification of organic farmers. Since 1996 farms certified by Biokultúra have been inspected independently by 'Biokontroll Hungária GG.' Nearly 90% of the Hungarian organic production is inspected by Biokontroll.

Table 7: Number of Organic Farms in Hungary

Year	Number of organic farms	Hectares
1988	15	1.000
1989	18	1.500
1990	49	1.965
1991	56	2.840
1992	51	3.330
1993	67	2.540
1994	73	2.250
1995	97	8.632
1996	143	16.400
1997	198	19.500
1998	256	28.500
1999	451	34.500
2000	n.a.	47.221

Source: FIBL, SÖL

Main organic products are wheat, sunflower seeds, pumpkin seed as well as fruit and vegetables. Since the vast majority of Western organic consumers does not eat very much meat, therefore organic animal products are of less importance leading to a surplus of organic meat.[5]

5 Ferenc Frühwald, Organic Farming in Hungary, FIBL website: http://www.organic-europe.net/country_reports/hungary/default.asp

6 Pesticide Production and Use in Hungary

Until the beginning of the 1990ties Hungary used to be one of the leading pesticide producer's world wide. It produced 60 out of the 200 most important pesticides. In 1998 the country still exported 28.800 tons of pesticides. About 13 companies produce pesticides for the domestic market and the export. Nevertheless, there are also several hundreds of companies importing pesticides, resulting in a total import of 18.654 tons in 1998. More detailed information on the pesticide production in Hungary can be found at the website of the Fluoride Action Network (FAN)[6] and the Hungarian Ministry of Economy and Transport.[7]

European crop protection market 1999-2000 (€ million)

Region	1999[a]	% change	2000
EU-15	6.078	-2,0	5.955
EFTA	98	+4,1	102
Five CEECs[b]	400	+5,0	420
Other CEECs[c]	265	-1,5	261
Russia	153	+18,3	181
Total	6.994	-1,1	6.919

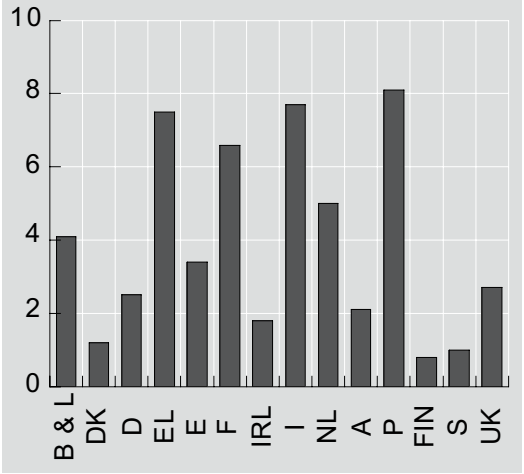
a. as reported by ECPA in 2000,
b. Czech Republic, Estonia, Hungary, Poland and Slovenia
c. rest of central and eastern Europe

Source: Agrow No 391, January 2002

Recent pesticide sales or usage data are not available in Hungary. Figure 1 shows the sales of pesticide products from 1993 through 1996. Information about active ingredients are not available either. Hungary actually collects sales data from wholesalers and local distributors by formulated product twice a year. The purpose of this mandatory data collection is to formulate more targeted pesticide policies.[8] However, information over the years 1996-2002 are not yet publicly available.

The agrochemical journal Agrow states in December 2000 that in Hungary: *"There has also been an increase in sales of agrochemicals and seed because farmers have been able to buy them in instalments."*[9]

Average Pesticide Use EU-15 1999 in kg/ha

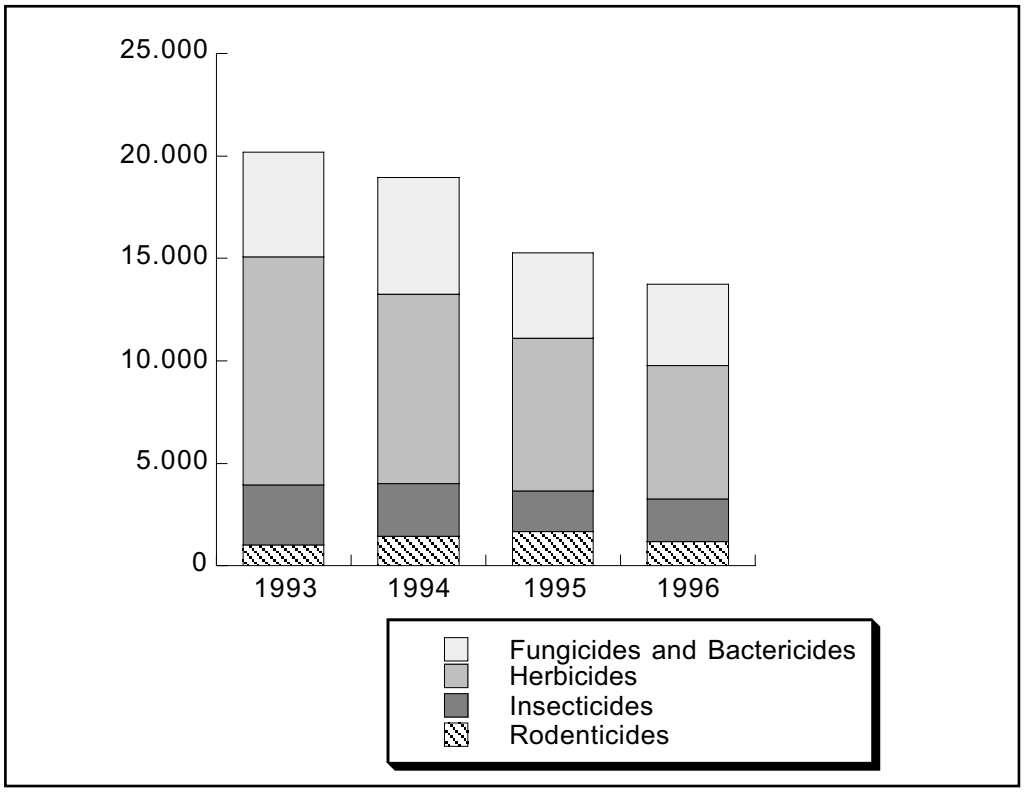


The 1993-1996 data presented in Figure 1 still shows a significant decrease in the sales of pesticides, especially herbicides and fungicides. Using the arable land data from 1996 (4.713.000 mill ha) and the sales data from 1996, the average pesticide product use is about 5,6 kg/ha. Since this data is outdated and based upon formulated products and not on active ingredients, this number cannot be compared with other countries. Statistics of pesticide use by hectare need to be interpreted with caution because*"... fewer than 10 percent of farms exhibit plant protection practices judged satisfactory from the professional aspect. Almost a half of all agricultural sites limit treatment to partial, occasional applications which in many cases, serve only*

6 Fluoride Action Network (FAN): http://www.fluoridealert.org/pesticides
7 Ministry of Economy and Transport (2000): Pesticide Production, The position of pesticide production in the chemical industry: http://www.gm.hu/kulfold/english/economy/industr/novszer.htm
8 OECD Series on Pesticides, Number 7 (1999): OECD Survey on the Collection and Use of Agricultural Pesticide Sales Data: Survey Results, Paris, France
9 PJB Publications Ltd. (200o): Agrow No 366, December 15th 2000, page 19

*to deal with the symptoms. About a third of all farms undertake no genuine activity with respect to plant protection at a*ll."[10]

Figure 1: Pesticide Use (formulated products) in Hungary 1993 - 1996 in Million Tons (mt)



Source: FAO

Table 8 shows the sales data by chemical class. Dithiocarbamate such as m*aneb, mancozeb, propineb, thiram* and *metiram*; carbamates herbicides such as c*hlorpropham, asulum, fenoxycarb, benfuracarb* as well as inorganic compounds (copper and sulphur) have declined sharply. It is quite remarkable that the sales of organochlorine pesticide have increased in the same time. To this class belong hazardous chemicals, such as DDT and Toxaphene, which are banned in Hungary, but other organochlorine pesticides such as *lindane, methoxychlor, dicofol* and *endosulfan* can be made resposible for the above mentioned sales increase.

Table 8: Pesticide Use in Hungary 1993 - 1996 (Mt)

	1993	1994	1995	1996
Chemical Class				
Fungicides & Bactericides				
Benzimidazoles	142	189	235	226
Dithiocarbamates	753	848	497	329
Inorganics	1.748	2.051	1,400	1.067
Other Fungicides	1.662	1.753	1.259	1.625

10 Láng, I. et al. (1995): The scientific basis of sustainable development in agriculture „AGRO-21" Füzetek, p. 12, Budapest in Gábor Szabó: Country report on the present environmental situation in agriculture-Hungary -Pannon Agricultural University, Kaposvár

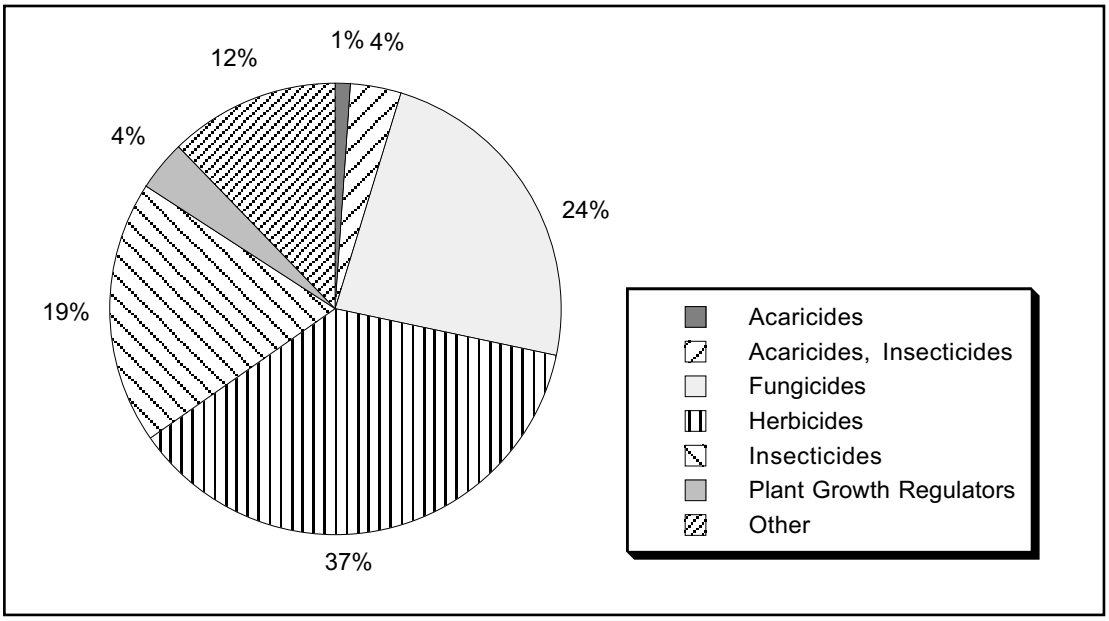
Table 8: (continued) Pesticide Use in Hungary 1993 - 1996 (Mt)

	1993	1994	1995	1996
Chemical Class				
Diazines, Morpholines	-	14	24	21
Sum Fungicides & Bactericides	5.111	5.685	4.152	3.978
Herbicides				
Amides	2.221	1.889	1.407	1.227
Bipiridils	345	421	232	202
Carbamates Herbicides	1.118	798	455	557
Dinitroanilines	968	792	637	1123
Other Herbicides	3.377	2.657	2.542	1.567
Phenoxy Hormone Products	1.761	14	980	854
Triazine	963	791	912	711
Sulfonyl Ureas	58	41	23	49
Uracil				11
Urea derivates	409	468	261	195
Triazole, Diazole	806	830	737	710
Sum Herbicides	11.122	9.257	7.449	6.496
Insecticides				
Botanic.Products & Biologic.	3	3	2	2
Carbamates Insecticides	105	79	88	57
Mineral Oils	88	148	148	135
Organo-Phosphates	1.372	1.547	1.175	1.219
Other Insecticides	1.112	555	461	466
Pyrethroids	268	237	155	208
Organochlorines	85	137	125	129
Sum Insecticides	2.945	2.558	2.006	2.081
Plant Growth Regulator	*18*	*38*	*5*	*11*
Rodenticides				
Anti-coagulants	75	52	36	126
Sum Rodenticides	1.004	1.451	1.658	1.176
Total	**29.639**	**35.303**	**27.675**	**26.558**

7 Characterisation of Authorized Pesticides in Hungary

The list of the pesticide active ingredients authorized in Hungary in 2000 was obtained from the Ministry of Agriculture. The list includes 360 substances authorised for the use in pesticide products. Use types were assigned to the 360 substances. Substances which are not pesticide active ingredients such as plant growth regulators are also listed. Figure 2 shows the major use types of the 360 substances.

Figure 2: Major Use Types of Substances Authorized for Use in Pesticide Products



Source: Ministry of Agriculture Hungary

Figure 2 summarises the major use types, Table 9 presents the specific type of use and the number of substances assigned.

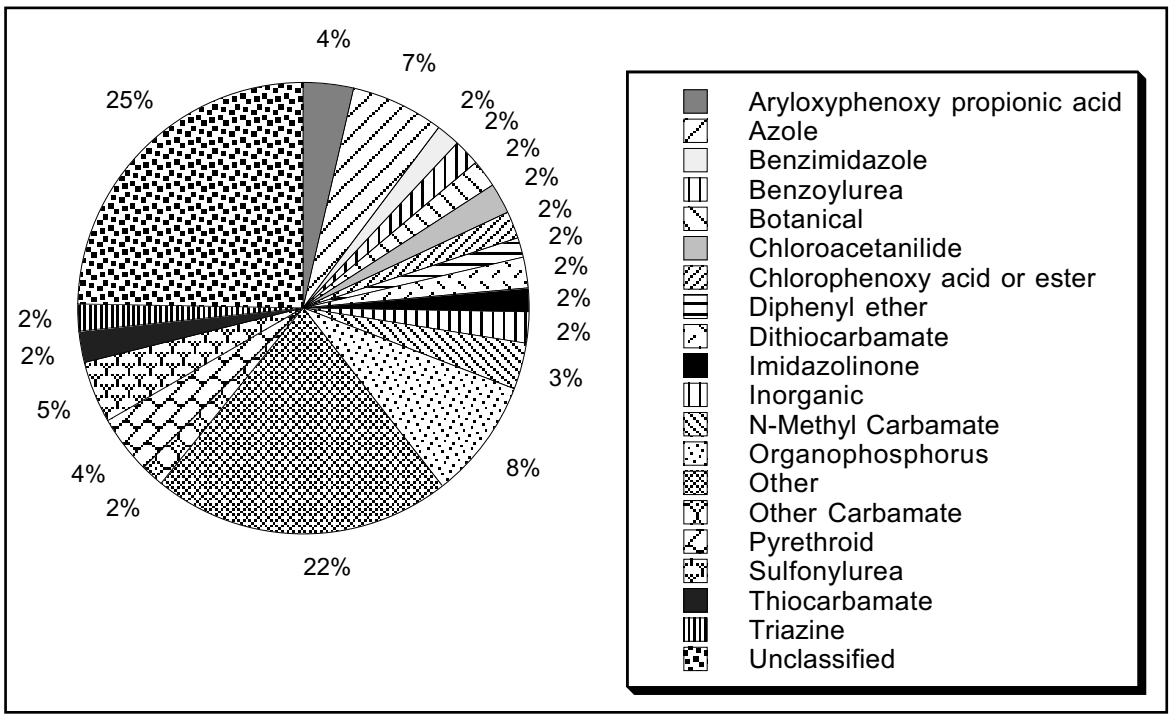
Table 9: Authorized Substances and their Use Types

Use Type	Abbreviation	Number of Substances
Major Use Types		316
Acaricides	AC	4
Acaricides, Insecticides	AC, IN	13
Fungicides	FU	85
Herbicides	HB	134
Insecticides	IN	68
Plant Growth Regulators	PG	13
Other Use Types		42
Acaricides, Fungicides	AC, FU	1
Acaricides, Insecticides, Nematicides	AC, IN, NE	1

Table 9: Authorized Substances and their Use Types		
Use Type	Abbreviation	Number of Substances
Adjuvants, Insecticides, Acaricides	AD, IN, AC	1
Bacteriocides, Fungicides	BA, FU	3
Break down product	Break down	1
Fungicides, Insecticides, Nematicides, Herbicides	FU, IN, NE, HB	1
Fumigants	FUM	2
Fumigants, Nematicides	FUM, NE	1
Herbicides, Acaricides, Insecticides, Nematicides, Fungicides, Rodenticide	HB, AC, IN, NE, FU, RO	1
Herbicide, Algicide	HB, AG	1
Insecticides, Acaricides	IN, AC	2
Insect Growth Regulator	IGR	1
Insect Growth Regulator, Acaricides	IGR, AC	1
Insecticides, Nematicides	IN, NE	2
Micro biocides	MB	2
Molluscicides	MO	2
Nematicides, Insecticide	NE, IN	1
Not specified	Not spec.	12
Plant Growth Regulators, Herbicide	PG, HB	2
Repellents, Fungicides	RE, FU	1
Repellents, Molluscicides	RE, MO	1
Rodenticide	RO	3

Existing database was used to determine the chemical classes of the authorized substances. Figure 3 shows the major chemical classes of the substances. Chemical classes with 4 or less substances are summarised as *Other* in the figure.

Figure 3: Major Chemical Classes of Substances Authorized for Use in Pesticide Products



Appendix 1 lists all 360 substances with their use types and chemical classes.

Recources to pesticides characteristics:

Online database maintained by Pesticide Action Network North America. World wide the most comprehensive online database on pesticides: www.pesticideinfo.org

ChemFinder is a portal of free and subscription scientific databases: www.chemfinder.com

Compendium of Pesticide Common Names, alphabetically lists some1000 pesticides, their use types and chemical classes: www.hclrss.demon.co.uk

8 Regulatory Status

All substances listed in Appendix 1 are registered for use in Hungary. In the European Union two legal instruments regulate pesticide active ingredients.

8. 1 Pesticide Authorization in the European Union - Council Directive 91/414 EEC

The authorization of pesticide active ingredients is regulated through Council Directive 91/414. Major goal of the Directive is to harmonize the authorization of plant protection products, and the establishment of a positive list of active ingredients on its Annex 1. Member States can only authorize plant protection products containing active ingredients listed on Annex 1, and under consideration of its efficiency, human toxicity, environmental fate, impact of non-target organism and other aspects listed in Article 4 of Directive 91/414.[11] In accordance with Directive 91/414 pesticide active ingredients, which were authorized before 25th July 1993 must be newly

reviewed regarding their toxicity and environmental fate utilising new test methods defined by other regulations. More than 800 pesticide active ingredients are undergoing this re-evaluation process. The proposed deadline for this procedure is 2008. The manufacturers of pesticide active ingredients have to finance the toxicity tests and must submit specific dossiers. For many pesticides active ingredients the expenses for the tests exceed the current or potential market volume. Therefore, for some 340 active ingredients new authorisation was not applied. After July 2003 the use of over 340 active ingredient is not allowed in the EU any more. The European Commissio assumes that further 150 active ingredients will be withdrawn by end of 2003. Altogether, some 60% of the over 800 active ingredients are then off the market.[12]

Currently, there are 54 active ingredients on Annex 1, 29 of them are so called new active ingredients (new ai), which have not been on the market in a Member State before 1993. New active ingredients can receive provisional authorization, which usually lasts 12 months.

In Hungary 24 new active ingredients received authorization.

In Hungary 30 of the 20 Annex 1 pesticides are authorized. For 68 pesticides, which are authorized in Hungary, authorization will expire in 2003 in the European Union. Authorization for one pesticide registered in Hungary already expired 2001 in the European Union. 181 of the pesticides authorized in Hungary are still in the EU re-evaluation process, and 70 are not part of the evaluation process.

Appendix 1 lists the 360 pesticide authorized in Hungary and their Status according to Directive 91/414. All legal documents regarding the authorization of pesticides in the EU can be found under http://europa.eu.int/comm/food/fs/ph_ps/pro/index_en.htm.

Recources to Directive 91/414:

European Commission Food Safety website on pesticide authorization:

http://europa.eu.int/comm/food/fs/ph_ps/pro/index_en.htm

8. 2 Water Framework Directive 2000/60/EEC

The Water Framework Directive 2000/60/EEC plus its related individual directives is currently the most important legal instrument concerning the pollution of the European Community‘s waters caused by dangerous chemicals. Directive 2000/60/EEC requires to adopt specific measurements preventing the pollution through individual contaminants and groups of contaminats, which pose a considerable risk to the aquatic environment and to sources of drinking water. Overall, the measurements of Directive 2000/60/EEC serve the internationally acknowledged goal to reduce concentrations of synthetic substances in the marine environment to sero.

Measurements regarding dangerous priority substances aim at the phase out or at the stepwise discontinuation of the pollution within 20 years after the adoption. In order to adopt specific measurement a list of priority substances including dangerous priority substances was conducted. This list can be found in Annes X of Directive 2000/60/EEC.[13] Table 10 presents sub-

11 European Union (1991): Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market, Official Journal 230, Brussels, Belgium

12 European Commission, Press release 4th of July 2002: 320 pesticides to be withdrawn in July 2003, http://europa.eu.int/comm/food/fs/ph_ps/pro/index_en.htm

stances listed in Annex X of Directive 2000/60/EEC, which are ingredients of pesticide products, and their regulatory status in Hungary.

Table 10: Priority Substances Used as Pesticide or in Pesticide Products and their Regulatory Status in Hungary

Substance	Use type	Priority Substance	Priority & Dangerous Substance	Authorized in Hungary
Alachlor	Herbicide	Yes		Yes
Atrazine	Herbicide	Yes	Yes***	Yes
Benzene	Solvent	Yes		No
Chlorfenvinphos	Insecticide	Yes		No
Chloroform	Solvent, Fumigant	Yes		No
Chlorpyrifos	Insecticide	Yes	Yes***	Yes
Diuron	Herbicide	Yes	Yes***	Yes
Endosulfan	Insecticide	Yes	Yes***	Yes
Endosulfan - alpha	Insecticide			No
Ethylene dichloride	Fumigant, Insecticide	Yes		No
Hexachlorobenzene	Fungicide, Microbiocide	Yes	Yes	No
Hexachlorocyclohexane	Insecticide	Yes	Yes	No
Isoproturon	Herbicide	Yes	Yes***	Yes
Lindane	Insecticide	Yes		No
Methylene chloride	Solvent	Yes		No
Naphthalene	Insecticide	Yes	Yes***	No
Nonyl phenol	Adjuvant		Yes	No
PCP	Wood Preservative, Microbiocide, Algaecide, Fungicide		Yes***	No
Pentachlorobenzene	not specified			No
Simazine	Herbicide		Yes***	No
Trichloromethane	Solvent	Yes		No
Trifluralin	Herbicide		Yes***	Yes

***Candidate; substance will be proofed as a priority dangerous substance.

Source: European Commission

13 European Community, Official Journal L331/1, Entscheidung Nr. 2455/2001/EG Des Europäischen Parlaments und des Rates vom 20. November 2001 zur Festlegung der Liste prioritärer Stoffe im Bereich der Wasserpolitik und zur Änderung der Richtlinie 2000/60/EG, Brussels

8. 3 International Conventions

There are two international conventions regulating pesticides with specific properties. The Stockholm or POPs Convention and the Rotterdam or PIC Convention.

The Stockholm Convention aims at the elimination of Persistent Organic Pollutants (POPs), some of the most unwanted chemicals in the world. POPs are toxic, bioaccumulative, highly persistent and pose a global threat to all living beings. Nine of the chemicals initially targeted by the POPs convention are pesticides. All nine pesticides are not registered for use in Hungary. The Stockholm Convention was signed in May 2001, to enter into force it now has to be ratified by at least 50 countries. Hungary was one of the signung countries, but has not yet ratified the convention.[14]

The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was adopted in Rotterdam on 10 September 1998. The Prior Informed Consent (PIC) Procedure is voluntary, but it has been unanimously accepted by member countries of the Foos and Agricultual Organisation (FAO) and the United Nations Environmental Programme (UNEP) and is supported by the leading chemical industry associations. Hungary also signed and ratified the convention.[15] The PIC Procedure disseminates information about the characteristics of potentially hazardous chemicals to the participating countries. It initiates a decision making process on the future import of these chemicals by the countries, and makes it possible to circulate this decision other countries.

Pesticides, industrial and consumer chemicals that have been banned or severely restricted for health or environmental reasons by the participating governments can be included in the procedure. In addition acutely toxic pesticide formulations which present a hazard under the conditions of use in developing countries may also be included.

The PIC procedure is an instrument, which formalises the decisions of importing countries concerning the import of such chemicals. The aim is to promote a shared responsibility between exporting and importing countries in protecting human health and the environment from the harmful effects of certain hazardous chemicals being traded internationally.[16] Table 11 list all PIC pesticide, their type of use, and their regulatory status in Hungary.

Table 11: PIC Pesticides and their Status of Authorization in Hungary

Pesticide	Use Type	PIC Pesticide	Authorized in Hungary
2,4,5-T	Herbicide	Yes	No
2-Fluoroacetamide	Rodenticide, Insecticide	Yes	No
Aldrin	Insecticide	Yes	No
Binapacryl	Herbicide	Yes	No
Captafol (isomer unspec.)	Fungicide	Yes	No
Carbofuran	Insecticide	Candidate	Yes
Chlordane	Insecticide	Yes	No

14 UNO website: http://www.unece.org/env/lrtap/status/98pop_st.htm
15 FAO website: http://www.fao.org/waicent/FaoInfo/Agricult/AGP/AGPP/Pesticid/PIC/convlist.htm
16 www.pic.int

Table 11: PIC Pesticides and their Status of Authorization in Hungary			
Pesticide	Use Type	PIC Pesticide	Authorized in Hungary
Chlordimeform	Insecticide	Yes	No
Benomyl	Fungicide	Candidate	Yes
DDT	Insecticide	Yes	No
Dieldrin	Insecticide	Yes	No
Dinoseb	Herbicide, Defoliant	Yes	No
Ethylene dibromide	Fumigant	Yes	No
Ethylene dichloride	Fumigant, Insecticide	Yes	No
Ethylene oxide	Fumigant	Yes	No
Heptachlor	Insecticide	Yes	No
Hexachlorobenzene	Fungicide, Microbiocide	Yes	No
Hexachlorocyclohexane (HCH)	Insecticide	Yes	No
Lindane	Insecticide	Yes	No
Merpafol cis isomer	Fungicide	Yes	No
Methamidophos	Insecticide, Breakdown product	Yes	Yes
Methyl parathion	Insecticide	Yes	Yes
Monocrotophos	Insecticide	Yes	No
Parathion	Insecticide	Yes	No
PCP	Wood Preservative, Microbiocide, Algaecide, Fungicide	Yes	No
Phosphamidon	Insecticide	Yes	No
Thiram	Fungicide	Candidate	Yes
Toxaphene	Insecticide	Yes	No

Recources to POPs and PIC Convention:

United Nations Environmental Programme (UNEP) POPs website: www.chem.unep.ch/pops or Stockholm Convention (POPs Convention) website: www.pops.int/

United Nations Environmental Programme (UNEP), website of Interim Secretariat for the Rotterdam Convention (PIC convention): www.pic.int

9 Human Toxicity Classification and Health Effects of Pesticides Authorized in Hungary

The human toxicity defines the different types of chronic and acute toxicity pesticides cause in humans, including cancer, reproductive and developmental toxicity, endocrine disruption and cholinesterase inhibition.

Various international established criteria for the evaluation of the human toxicity do exist. The generally accepted "Recommended Classification of Pesticides by Hazard And Guidelines to Classification" published by the World Health Organisation (WHO)[17] will be used to evaluate the acute toxicity of the pesticide authorized in Hungary. Irreversible effects will be evaluated using classifications of the International Agency of Research on Cancer (IARC), the European Union, the U.S. Environmental Protection Agency (U.S. EPA) and the *acceptable daily intake* (ADI) of the WHO. Additional information about adverse effects, such as endocrine disrupting effects and cholinesterase inhibition will be provided as well.

The summarised listings and categories of pesticide authorized in Hungary can be found in Appendix 2. A number of pesticide ingredients were excluded from the evaluation list, these are such as unclassified substances such as vegetable oil, waxes, plant growth regulators, breakdown products and substances, which were not defined exactly. Altogether 26 substances were excluded. The exclusion was done because toxicity information for most of these compound is not available.

The following Chapter have largely been taken from two studies: *Beyond POPs - Evaluation of Evaluation of the UNEP Chemical Substitutes of the POPs Pesticides Regarding their Human and Environmental Toxicity*[18] and from the Risk Study in *From Law to Field - Pesticide Use Reduction in Agriculture - From Pesticide Residue Analyses to Action.*[19]

9. 1 Acute Toxicity - World Health Organisation (WHO)

246 of the ingredients authorized in Hungary are classified by the WHO: 7 as Extremely Hazardous, 15 as Highly Hazardous, 57 as Moderately Hazardous, 57 as Slightly Hazardous and 110 as Unlikely to present hazard in normal use.

The acute toxicity of a substance is widely used and accepted as criteria for risk assessment. Standardised animal tests, primarily with rats, are employed to determine the LD_{50}, the estimated dose which is lethal to 50 percent of the tested population.

In 1975 the WHO published, with approval from the 28th World Health Assembly, their first classification of pesticides by hazard. The guidelines on the classification of individual pesticides, the actual tables, were established in 1978 and have since been revised at two-year intervals.[20] The WHO classification is based on the physical state of an active ingredient ("solid" or "liquid") and on LD_{50} values for rats via dermal and oral routes. The recommended classifi-

17 World Health Organisation (2000-02): The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2000-02 (WHO/PCS/01.5), WHO, Vienne, Switzerland

18 Neumeister, L. (2001): Beyond POPs - Evaluation of Evaluation of the UNEP Chemical Substitutes of the POPs Pesticides Regarding their Human and Environmental Toxicity, Pestizid Aktions-Netzwerk Germany, Hamburg, Germany

19 Neumeister, L., Mücke, M., Ruhnau, M. Weber C., (2002): From Law to Field - Pesticide Use Reduction in Agriculture - From Pesticide Residue Analyses to Action, Pestizid Aktions-Netzwerk Germany, Hamburg, Germany

20 World Health Organisation (2000-02): The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2000-02 (WHO/PCS/01.5), WHO, Vienne, Switzerland

cation of pesticides are presented in Table 12. LD_{50} values via inhalation are not included in the classification. This is a major deficiency because users of pesticides are often exposed by air. Formulations and mixtures are also not included in the classification. The acute toxicity of formulations and mixtures can be calculated with a given calculation which is derived from the percentage and the LD_{50} values of active ingredients in the formulation or mixture. The potential increase in acute toxicity due to so-called 'inert' ingredients[21] [22] is neglected in this calculation. Health effects other than acute toxicity, such as carcinogenicity, have been taken into account for many compounds; the classification has been accordingly adjusted.

Table 12: WHO Recommended Classification of Pesticides by Hazard

Classification		LD_{50} in rat (mg/kg body weight)			
		Oral		Dermal	
		Solids	Liquids	Solids	Liquids
Ia	Extremely hazardous	5 or less	20 or less	10 or less	40 or less
Ib	Highly hazardous	5 - 50	20 - 200	10-100	40 - 400
II	Moderately hazardous	50 - 500	200 - 2000	100-1000	400 - 4000
III	Slightly hazardous	Over 500	Over 2000	Over 1000	Over 4000

Source: World Health Organisation (2000-02): The WHO Recommended Classification of Pesticides by Hazard And Guidelines to Classification 2000-02

The WHO classification guidelines are a collection of proposed data reviewed by the International Programme on Chemical Safety (IPCS). Any interested party can propose new entries or comment on entries, provided tests and data are representative.

When several LD_{50} values have been reported, the WHO/IPCS uses the lowest reliable value. Usually the oral route values are used, except when the dermal route value places the substance in a more hazardous class.

219 ingredients authorized in Hungary are listed in the WHO classifications. The acute toxicity classification of them can be found in Appendix 2.

9. 2 Acute Toxicity - European Union

180 of the ingredients authorized in Hungary are classified by the European Union: 25 as Very Toxic, 34 as Toxic, 87 as Harmful and 19 as Irritant.

The major legislative framework in force dealing with dangerous substances in the European Union is the Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.[23] There have been 28 amendments, adoptions and/ or modifications

21 "inert" ingredient: substances which can enhance the efficiency of the active substance, make a product more degradable or easier to use. 'Inerts' are mostly handled as trade secrets of the manufacturer, which means they are not labelled on the product and therefore not included in the calculation. (More information see footnote 22.)

22 Marquardt, S., Cox, C., Knight, H. (1998): Toxic Secrets, "Inert" Ingredients in Pesticides 1987-1997, Northwest Coalition for Alternatives on Pesticides, Californians for Pesticide Reform

since establishing this framework. Most of them can be found on the website of the European Union.[24] The list of chemicals, their risk classification, information on labelling, packaging and safe use can be found as Annex I of this directive. This Annex I was completely and updated obtained from the responsible European Chemicals Bureau.[25] The classification system of the EU goes further than the WHO acute toxicity classification. The combination of danger symbols for acute hazards with descriptive risk phrases for acute as well as subchronic and chronic toxicity, plus the categories for mutagenic, carcinogenic and reproductive effects, presents a fairly comprehensive instrument for the evaluation of chemicals.

The symbols and risk phrases describe following effects:

- acute toxicity (lethal and irreversible effects after a single exposure)
- subacute, subchronic or chronic toxicity
- corrosive and irritant effects
- sensitising effects
- specific effects on health (carcinogenicity, mutagenicity and reproductive toxicity)

The description of the criteria can be found in the amendment paper 393L0021 (Commission Directive 93/21/EEC of 27 April 1993), a modification to the directive 67/548/ EEC.

There are three acute toxicity classifications (see following table) and, in contrast to the WHO classification, the exposure routes via air are included in the classification system. The specific effects on health such as carcinogenicity, mutagenicity and reproductive toxicity will be addressed in Chapter 9. 4. 3.

The toxicity of the ingredients authorized in Hungary, according to the classification of the European Union, can be found in Appendix 2 as well as the risk phrases and the descriptions of the symbols.

Table 13: Acute Toxicity Classification - Danger Symbols and Risk Phrases in the European Union

Classification		LD50 in rat mg/kg body weight			Risk Phrases
		Oral	Dermal[a]	Inhalation[b]	
T+	Very toxic	25	50	0,25	28, 27, 26, 39[c]
T	Toxic	25 -200	50 - 400	0,25 to 1	23, 24, 25, 39, 48[d]
Xn	Harmful	200 - 2000	400 - 2000	1 to 5	(22)[e], 65, 40[f], 48

a. test species rat or rabbit for “Dermal”
b. Lethal Concentration = LC50 in rat mg/litre par 4 hours
c. Danger of very serious irreversible effects - Strong evidence that irreversible damage is likely to be caused by a single exposure
d. Danger of serious damage to health by prolonged exposure

23 European Union (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium

24 European Union (2000): Legislation in Force, http://www.europa.eu.int/eur-lex/en/lif/dat/1994/en_294A0103_51.html, Brussels, Belgium

25 personel communication with Dr. Elisabet Berggren (Classification/Labelling and Export/Import), European Chemicals Bureau, Italy, April 2001

e. replaced by R65
f. Possible risk of irreversible effects - strong evidence that irreversible damage is likely to be caused by a single exposure

The partly remarkable differences between the acute toxicity classification of the WHO and the EC are due to the fact that the WHO incorporates other health effects in addition to the acute toxicity for some substances. Several entries into the toxicity category define different toxicities for different exposure routes. The risk phrases 24-26/28, for instance, mean R24: Toxic in contact with skin and R26/28: Very toxic by inhalation and if swallowed.

9. 3 Cholinesterase Inhibition

39 of the ingredients authorized in Hungary are cholinesterase inhibitors (ChE).

Pesticides undergo different modes of action: organophosphorus (OP) and N-methyl carbamate (CB) pesticides inhibit primarily the acetylcholinesterase (AChE) and butyrylcholinesterase (BuChE) enzymes by phosphorylation and carbamation, respectively. This simply means that these pesticides change the enzyme structure, and therefore the enzyme becomes inactivated. Acetylcholinesterase is responsible for turning off the signal flow ensured by the neurotransmitter acetylcholine between a nerve cell and a target cell; for instance, a muscle fiber, gland or another nerve cell. Since the neurotransmitters are in charge of passing on a signal which leads to a stimulation, the inhibition of the signal-stopping enzyme leads to an overstimulation. This overstimulation is the reason, usually due to pulmonary secretion and respiratory failure, for the death of the poisoned person.[26]

As in all poisoning, the grade of poisoning is dependant upon several parameters: exposure time, exposure dose, age, gender and constitution of the affected person.

There is very little knowledge regarding the function of butyrylcholinesterase (BuChE) in the nervous system. Several uncertainties have been defined. For example, it is not known if BuChE plays a role in the development and/or functioning of the nervous system, nor is it known if BuChE and/or AChE and other esterases play a more general role in cell growth and cell death, including in carcinogenesis. Over cholinergic pathways, the neurotransmitter acetylcholine acts in the entire human body: in the central nervous system (brain and spinal cord), as well as the peripheral nervous system. Little is known about the distribution of cholinergic pathways in the brain and their functions. Behavioural, cognitive, and psychological changes can only be observed on humans; animal testing fails here in most cases. There is also little knowledge about the effects of longer term/ low dose exposures. The complexity of cholinesterase inhibition caused by pesticides can therefore hardly be assessed.

The approach of the U.S. EPA Office of Pesticide Programmes (OPP) is to measure cholinesterase inhibition in blood cells, but they also admit that more research needs to be done to appropriately address the complex effects. The Science Advisory Panel of OPP notes that *"...under SOME circumstances, measurement of SOME blood-borne cholinesterases would be appropriate to consider in establishing RfDs[27] for anticholinesterases...."*,and *"Measured inhibition of cholinesterase activities in any of the blood fractions is best regarded as an imperfect mirror of enzyme inhibition in the true target tissues...."*[28]

26 Reigart, J. R., Roberts, J. R. (1999): Recognition and Management of Pesticide Poisonings, Office of Prevention, Pesticides, and Toxic Substances, US Environmental Protection Agency, Washington, USA
27 Reference Dose, (note of the author)

At least two organisations use the measurement of cholinesterase inhibition in the blood: the California Department of Health Services (CDHS) removes agricultural workers who have been in contact with highly toxic organophosphorous or carbamate compounds and whose blood plasma or red blood cell levels show a certain percentage of cholinesterase inhibition from the workplace. The World Health Organisation (WHO) has similar guidelines as the CDHS and considers plasma inhibition of 50% a 'toxic' decrease.[29]

9. 4 Chronic Toxicity and Irreversible Damages

Chronic toxicity and irreversible damages caused by pesticides include: cancer; mutagenic, developmental, and reproductive toxicity; endocrine disrupting; and potential after-effects of cholinesterase inhibition. The latter has been discussed in Chapter 9. 3.

The procedures by which most organisations classify chemicals as carcinogenic, mutagenic or developmental and reproductive toxicants are often very similar. They mostly involve first the selection of chemicals to evaluate, then bringing together a board of scientists who evaluate the available data and make a decision about a ranking, based upon the weight of the evidence. The data evaluated include in most cases epidemiological studies on humans exposed to the chemical, as well as studies on laboratory animals. Some organisations also use the evaluation results of other authorities and apply a new classification to it. Pesticides which have been on the market for a longer time have been studied often more extensively than 'newer' chemicals. The more available data base results in a presumably more accurate rating.

9. 4. 1 Carcinogenicity Classification - International Agency for Research on Cancer (IARC)

25 of the ingredients authorized in Hungary are evaluated by the IARC: 7 as possibly carcinogenic to humans. 18 are considered as not classifiable as carcinogenic to humans.

The International Agency for Research on Cancer (IARC) is part of the World Health Organisation (WHO). The goal of IARC is to evaluate, with the assistance of international working groups of experts, critical reviews and evaluations of evidence of carcinogenicity and to publish them in monographs. This series of monographs started in 1972 and since then, some 860 agents have been reviewed. Participants in the working groups are individual scientists who do not represent organisations, industry or governments.Their task is:

- to ensure that all appropriate data have been collected;
- to select the relevant data;
- to prepare summaries of the data to enable the reader to follow the reasoning of the working group;
- to evaluate the results of epidemiological and experimental studies on cancer;

28 U.S. EPA, Office of Pesticide Programmes (2000): Science Policy on The Use of Data on Cholinesterase Inhibition for Risk Assessments of Organophosphorous and Carbamate Pesticides, p. 16. Office of Pesticide Programme, US Environmental Protection Agency, Washington, USA

29 U.S. EPA, Office of Pesticide Programmes (2000): Science Policy on The Use of Data on Cholinesterase Inhibition for Risk Assessments of Organophosphorous and Carbamate Pesticides, Office of Pesticide Programme, US Environmental Protection Agency, Washington, USA

- to evaluate data relevant to the understanding of mechanism of action; and
- to make an overall evaluation of the carcinogenicity of the exposure to humans.[30]

The evaluation leads to a classification which is divided into five groups as displayed in the Table 14.

Table 14: IARC Classification on Carcinogenicity

Category	Description
Group 1	The agent (mixture) is carcinogenic to humans.
Group 2A	The agent (mixture) is probably carcinogenic to humans.
Group 2B	The agent (mixture) is possibly carcinogenic to humans.
Group 3	The agent (mixture) is not classifiable as to its carcinogenicity to humans.
Group 4	The agent (mixture) is probably not carcinogenic to humans.

None of the ingredients registered in Hungary, is classified as probably carcinogenic to humans (Group 2A) by the IARC. This category is used when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals. Seven of the ingredients authorized in Hungary are classified as possibly carcinogenic to humans (Group 2B). This classification is applied when limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals exist. It also may be used when adequate evidence of carcinogenicity in humans does not exist but there is sufficient evidence of carcinogenicity in experimental animals. In some cases, a substance for which adequate evidence of carcinogenicity in humans does not exist *but* for which limited evidence of carcinogenicity in experimental animals together with supporting evidence from other relevant data is present, may be placed in this group. Sixteen are not classifiable as carcinogenic to humans (Group 3). This group is applied mostly for substances for which the evidence of carcinogenicity is inadequate in humans and inadequate or limited in experimental animals.

9. 4. 2 Carcinogenicity Classification - U.S. Environmental Protection Agency (U.S. EPA)

The U.S. EPA Office of Pesticide Programmes maintains a List of Chemicals Evaluated for Carcinogenic Potential.[31]This list is a product of the general risk assessment included in the process of the pesticide registration. This classification can be seen as a development of the IARC classification system, but also includes the potential exposure of humans.[32] Therefore, a low exposure potential can place a pesticide in a lower category even when sufficient evidence of carcinogenicity exists. U.S. EPA's classification of carcinogenicity has changed three

30 International Agency for Research on Cancer (1999): Preamble to the IARC Monographs, IARS Monographs, accessible through: http://www.iarc.fr/, Lyon, France

31 US Environmental Protection Agency Office of Pesticide Programmes (2000): List of Chemicals Evaluated for Carcinogenic Potential, U.S. EPA Office of Pesticide Programmes, Washington, DC, USA

32 Altenburger, R., Bödeker, W., Brückmann, S., Oetken, G., Weber, C., (1999) Zur Human- und Ökotoxizität von Pestiziden, die im Bananenanbau verwendet werden, Pestizid Aktions-Netzwerk e.V. (PAN Germany), Hamburg, Germany

times over the last 15 years. The categories used by U.S. EPA between 1986 to the present are presented in the following tables:

Table 15: U.S. EPA Classification of Carcinogenic Substances (1986 - 1996)

Category	Description
Category A	Known to cause cancer in humans. Generally based on epidemiological data showing sufficient evidence to support a causal association between exposure to the substance and cancer.
Category B	Known to cause cancer in animals but not yet definitively shown to cause cancer in humans. These chemicals are designated “probable human carcinogens.” Category B is further split into pesticides for which some evidence exists that it causes cancer in humans (B1) and those for which evidence exists only in animals (B2).
Category C	Possible human carcinogens, where the data show limited evidence of carcinogenicity in the absence of human data.
Category D	This category is for chemicals for which the data are either incomplete or ambiguous and is labelled “cannot be determined.” This category is appropriate when tumour effects or other key data are suggestive or conflicting or limited in quantity and are thus not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further chemical-specific and generic research and testing are needed to be able to describe human carcinogenic potential.
Category E	Probably not carcinogenic, with no evidence of carcinogenicity in at least two adequate animal tests in different species in adequate epidemiological and animal studies. This classification is based on available evidence and does not mean that the agent will not be a carcinogen under any circumstances.

Table 16: U.S. EPA Classification of Carcinogenic Substances (1996 - 1999)

Category	Description
Known/Likely	This category of descriptors is appropriate when the available tumor effects and other key data are adequate to convincingly demonstrate carcinogenic potential for humans; it includes: Agents known to be carcinogenic in humans based on either epidemiologic evidence of a combination of epidemiologic and experimental evidence, demonstrating causality between human exposure and cancer. Agents that should be treated as if they were known human carcinogens, based on a combination of epidemiologic data showing a plausible causal association (not demonstrating it definitively) and strong experimental evidence. Agents that are likely to produce cancer in humans due to the production or anticipated production of tumors by modes of action that are relevant or assumed to be relevant to human carcinogenicity.

Table 16: (continued)U.S. EPA Classification of Carcinogenic Substances (1996 - 1999)	
Category	Description
Cannot be determined	This category of descriptors is appropriate when available tumor effects or other key data are suggestive or conflicting or limited in quantity and thus, are not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further agent-specific and generic research and testing are needed to be able to describe human carcinogenic potential. The descriptor 'cannot be determined' is used with a subdescriptor that further specifies the rationale: Agents whose carcinogenic potential cannot be determined, but for which there is suggestive evidence that raises concern for carcinogenic effects. Agents whose carcinogenic potential cannot be determined because the existing evidence is composed of conflicting data (e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm any concern), agents whose carcinogenic potential cannot be determined because there are inadequate data to perform an assessment. Agents whose carcinogenic potential cannot be determined because no data arr available to perform an assessment.
Not likely	This is the appropriate descriptor when experimental evidence is satisfactory for deciding that there is no basis for human hazard concern, as follows (in the absence of human data suggesting a potential for cancer effects): Agents not likely to be carcinogenic to humans because they have been evaluated in at least two well conducted studies in two appropriate animal species without demonstrating carcinogenic effects. Agents not likely to be carcinogenic to humans because they have been appropriately evaluated in animals and show only carcinogenic effects that have been shown not to be relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha(2u)-globulin). Agents not likely to be carcinogenic to humans when carcinogenicity is dose or route dependent. For instance, not likely below a certain dose range (categorized as likely by another route of exposure). To qualify, agents will have been appropriately evaluated in animal studies and the only effects show a dose range or route limitation, or a route limitation is otherwise shown by empirical data. Agents not likely to be carcinogenic to humans based on extensive human experience that demonstrates lack of effect (e.g., phenobarbital).

Table 17: U.S. EPA Classification of Carcinogenic Substances (1999 to present)	
Category	Description
Carcinogenic to humans	This descriptor is appropriate when there is convincing epidemiologic evidence demonstrating causality between human exposure and cancer. This descriptor is also appropriate when there is an absence of conclusive epidemiologic evidence to clearly establish a cause and effect relationship between human exposure and cancer, but there is compelling evidence of carcinogenicity in animals and mechanistic information in animals and humans demonstrating similar mode(s) of carcinogenic action. It is used when all of the following conditions are met: There is evidence in a human population(s) of association of exposure to the agent with cancer, but not enough to show a causal association, and There is extensive evidence of carcinogenicity, and The mode(s) of carcinogenic action and associated key events have been identified in animals, and The key events that precede the cancer response in animals have been observed in the human population(s) that also shows evidence of an association of exposure to the agent with cancer.

Table 17: (continued)U.S. EPA Classification of Carcinogenic Substances (1999 to present)	
Category	Description
Likely to be carcinogenic to humans	This descriptor is appropriate when the available tumor effects and other key data are adequate to demonstrate carcinogenic potential to humans. Adequate data are within a spectrum. At one end is evidence for an association between human exposure to the agent and cancer and strong experimental evidence of carcinogenicity in animals; at the other, with no human data, the weight of experimental evidence shows animal carcinogenicity by a mode or modes of action that are relevant or assumed to be relevant to humans.
Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential	This descriptor is appropriate when the evidence from human or animal data is suggestive of carcinogenicity, which raises a concern for carcinogenic effects, but is judged not sufficient for a conclusion as to human carcinogenic potential. Examples of such evidence may include; a marginal increase in tumors that may be exposure-related, or evidence is observed only in a single study, or the only evidence is limited to certain high background tumors in one sex of one species. Dose-response assessment is not indicated for these agents. Further studies would be needed to determine human carcinogenic potential.
Data are inadequate for an assessment of human carcinogenic potential	This descriptor is used when available data are judged inadequate to perform an assessment. This includes a case when there is a lack of pertinent or useful data or when existing evidence is conflicting, e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm a concern.
Not likely to be carcinogenic to humans	This descriptor is used when the available data are considered robust for deciding that there is no basis for human hazard concern. The judgement may be based on: Extensive human experience that demonstrates lack of carcinogenic effect (e.g., phenobarbital). Animal evidence that demonstrates lack of carcinogenic effect in at least two well designed and well conducted studies in two appropriate animal species (in the absence of human data suggesting a potential for cancer effects). Extensive experimental evidence showing that the only carcinogenic effects observed in animals are not considered relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha-2u-globulin).Evidence that carcinogenic effects are not likely by a particular route of exposure. Evidence that carcinogenic effects are not anticipated below a defined dose range.

Source: EPA (2000): List of Chemicals Evaluated for Carcinogenic Potential

Appendix 2 lists pesticides authorized in Hungary and their cancer category assigned by U.S. EPA. Reflecting the classification date, all three types of categories can be found in Appendix 2.

9. 4. 3 Classifications of Carcinogenic, Mutagenic and Reproductive Toxicants - European Union

17 of the ingredients authorized in Hungary cause concern for humans due to possible carcinogenic effects and have been placed into the carcinogenicity category 3 by the EU. 1 may cause heritable genetic damage; 10 cause concern for humans owing to possible mutagenic effects and have been placed into the mutagenicity category 3; and 5 may cause harm to the unborn child and 10 present possible risks of harm to the unborn child.

The classification of carcinogenic, mutagenic and reproductive toxicants is part of the Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.[33] In the 18th amendment[34] of this directive the procedure of labelling and classification is described. The process of classification differs considerably from other organisations.

The manufacturer of a substance is required to implement the testing according to Annex V of the Directive 67/548/EEC, which describes the methods to determine the physical-chemical properties, the human and the environmental toxicity.[35] They have to submit all available relevant data to the Member State in which the substance is planned to be sold. In addition the manufacturer has to label its substance provisionally according to the EU criteria. If the manufacturer gains new relevant data, these are also required to be presented as soon as possible to the Member State. The preliminary classification applied by the manufacturer is valid as long as no other conclusions about the substance can be reached or as long as no Member State has relevant information justifying (or not) the categories. Member States which have relevant data on this substance are obligated to forward this information to the Commission. The Commission forwards the information about classification and labelling of the substance to all Member States, who may notify the Commission in case their own data prove the classification inappropriate. If no objections or newer relevant data arise, the preliminary classification is valid until the substance is officially classified and registered by the EC. The following chapter describes the EC classification of carcinogenic, mutagenic substances, and substances toxic to reproduction.

Carcinogenicity

The European Union defines three categories for carcinogenicity, which are presented in Table 18. There are inherent difficulties in assigning substances into Category 1 due to the fact that this is done on the basis of epidemiological data.[36] Therefore it seems to be impossible to classify products which have been on the market for a short time or for products with a low volume

33 European Union (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium

34 European Union (1993): Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

35 This Annex has been updated regularly in light of the technical progress. Test methods of the OECD are mostly being used.

36 European Union (1993): Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

of production i.e. low exposure potential. The exact processes and the principles of assessment to place a substance in Category 1 have not been documented.

Placing a substance into Categories 2 and 3 is based primarily on animal experiments. To assign a substance to Category 2, two animal species should show positive results, or one species should show clear evidence of carcinogenicity. In addition, other supporting evidence must exist.

Category 3 places substances which are well investigated but for which the evidence of carcinogenic effects are insufficient for classification in Category 2. Category 3 also places substances which are insufficiently investigated. The available data are inadequate, but they raise concern for humans. This classification is temporary; further investigations are necessary before a final classification can be made. For a distinction between Category 3 and a classification as non-carcinogenic, the following criteria are valid:

- the substance should not be classified in any of the categories if the mechanism of experimental tumour formation is clearly identified, with good evidence that this process cannot be extrapolated to humans,
- the substance may not be classified in any of the categories if the only available tumour data are liver tumours in certain sensitive strains of mice, without any other additional evidence,
- particular attention should be paid to cases where the only available tumour data are the occurrence of neoplasms at sites and in strains where they are well known to occur spontaneously with a high incidence.

The EU description of the criteria fails to mention whether or not ‘newer’ substances due to insufficient investigation are automatically placed into Category 3.

Table 18: EU Classification of Carcinogenic Substances

Category	Description	Symbol & Risk Phrases
Category 1	Substances known to be carcinogenic to humans. There is sufficient evidence to establish a causal association between human exposure to a substance and the development of cancer.	T; R45 May cause cancer; T; R49 May cause cancer by inhalation
Category 2	Substances which should be regarded as if they are carcinogenic to humans. There is sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer, generally on the basis of appropriate long-term animal studies or other relevant information.	T; R45 May cause cancer T; R49 May cause cancer by inhalation
Category 3	Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.	Xn; R40 Limited evidence of a carcinogenic effect.[a]

a. Risk phrase R40 changed. (Commission Directive 2001/59/ECof 6 August 2001adapting to technical progress for the 28th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances)

Mutagenicity

The European Union defines three categories for mutagenicity, which are presented in Table 19. With Directive 2000/32/EEC of 19th May 2000 the European Union modified the Directive 67/548EEC for the 26th time.[37] This modification deals almost solely with testing methods for mutagenic substances and has to be enforced by the Member States by the 1st June of 2001. It is to expect that the application of newer test methods will change the assessment and classification of substances in the EU.

To place a substance in Category 1, positive evidence from human mutation epidemiology studies is needed. According to the EU, examples of such substances are not known to date. For Category 1 mutagenicity the same objections as for Category 1 in the Chapter on Carcinogenicity (page 30) may arise. To place a substance in Category 2, positive results are needed from experiments showing mutagenic effects or other cellular interactions relevant to mutagenicity in germ cells of mammals in vivo, or mutagenic effects in somatic cells of mammals in vivo in combination with clear evidence that the substance or a relevant metabolite reaches the germ cells.

Ten of the Pesticides authorized in Hungary have been placed into Category 3. To place a substance in Category 3, positive results are needed in experiments showing mutagenic effects or other cellular interaction relevant to mutagenicity, in somatic cells in mammals in vivo. The latter especially would usually be supported by positive results from in vitro mutagenicity experiments.

Additionally, a distinction between Category 3 and no classification is not described.

Table 19: EU Classification of Mutagenic Substances

Category	Description	Symbol & Risk Phrases
Category 1	Substances known to be mutagenic to humans. There is sufficient evidence to establish a causal association between human exposure to a substance and heritable genetic damage.	T; R46 May cause heritable genetic damage.
Category 2	Substances which should be regarded as if they are mutagenic to humans. There is sufficient evidence to provide a strong presumption that human exposure to the substance may result in the development of heritable genetic damage, generally on the basis of appropriate animal studies, or other relevant information.	T; R46 May cause heritable genetic damage.

37 European Union (2000): Council Directive 2000/32/EEC of 19 May 2000 adapting to technical progress for the 26th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 136, Brussels, Belgium

Table 19: EU Classification of Mutagenic Substances		
Category 3	Substances which cause concern for humans owing to possible mutagenic effects. There is evidence from appropriate mutagenicity studies, but this is insufficient to place the substance in Category 2.	Xn; R68[a] Possible risk of irreversible effects.

a. New risk phrase R68. (Commission Directive 2001/59/ECof 6 August 2001adapting to technical progress for the 28th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances)

Reproductive Toxicity

There are three categories for the classification of substances toxic to the reproduction. To place a substance into Category 1 sufficient evidence must exist that there is a causal relationship between impaired fertility and/ or developmental toxic effects and human exposure. This actually means that a substance newly introduced on the market cannot be placed in Category 1. To place a substance into the Categories 2 and 3 animals studies must deliver information on impaired fertility or developmental toxic effects.[38]

Table 20: EU Classification of Substances Toxic to Reproduction		
Category	Description	Symbol & Risk Phrases
Category 1	1. Substances known to impair fertility in humans. 2. Substances known to cause developmental toxicity in humans.	T; R60: May impair fertility. T; R61: May cause harm to the unborn child.
Category 2	1. Substances which should be regarded as if they impair fertility in humans. 2. Substances which should be regarded as if they cause developmental toxicity to humans.	T; R60: May impair fertility. T; R61: May cause harm to the unborn child.
Category 3	1. Substances which cause concern for human fertility. 2. Substances which cause concern for humans owing to possible developmental toxic effects.	Xn; R62: Possible risk of impaired fertility. Xn; R63: Possible risk of harm to the unborn child.

9. 4. 4 Chronic Toxicity - Acceptable Daily Intake (WHO/FAO)

In absence of an international classification system for chronic toxicity, the acceptable daily intake (ADI) is used in this study as a measurement for chronic toxicity.

The acceptable daily intake (ADI) has been developed to assess chronic hazards posed by pesticide residues. It is the assumed amount a human can consume on a daily basis without causing damages to health. The ADI is assigned by the Joint FAO/WHO Meeting on Pesticide

38 European Union (1993): Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

Residues (JMPR) on the basis of an examination of available information, including data on the biochemical, metabolic, pharmacological, and toxicological properties of the pesticide extracted from studies of experimental animals and observations in humans. Used as the starting-point is the no-observed-adverse-effect level (NOAEL) for the most sensitive toxicological parameter, usually in the most sensitive species of experimental animal. To take into account the type of effect, the severity or reversibility of the effect, and the problems of inter- and intraspecies variability, a safety factor is applied to the NOAEL to determine the ADI for humans.[39]

The ADI values can be found in Appendix 2. For 110 of the valuated pesticides an ADI value has been assigned.[40]

Resources to human toxicology of pesticides and chemicals:

IPCS INCHEM is a means of rapid access to internationally peer reviewed information on chemicals commonly used throughout the world, which may also occur as contaminants in the environment and food. The homepage links to the IARC and the WHO classifications, to the International Chemical Safety Cards (ICSCs) and to the JMPR (Joint Meeting on Pesticide Residues) - monographs and evaluations: www.inchem.org

Online database maintained by Pesticide Action Network North America. World wide the most comprehensive online database on pesticides: www.pesticideinfo.org

California Department of Resticide Regulation (DPR) website lists some 386 chemicals and allows access to Toxicology Data Review Summaries in form of Acrobat Reader pdf files:

www.cdpr.ca.gov/docs/toxsums/toxsumlist.htm

Health and Safety information has been collected on over 2000 chemicals studied by the U.S. National Toxicology Program: http://ntp-server.niehs.nih.gov/default.html

Recognition and Management of Pesticide Poisoning is published by U.S. EPA's Office of Pesticide Programs. Explains the mode of action of common pesticide groups and treatment possibilities: www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm, the homepage of the U.S. EPA's Office of Pesticide Program offers a large amount scientific and general information: www.epa.gov/pesticides

39 Global Environment Monitoring System – Food Contamination Monitoring and Assessment Programme (GEMS/Food) and Codex Committee on Pesticide Residues (1997): Guidelines for Predicting Dietary Intake of Pesticide Residues, WHO/FSF/FOS/97.7, Programme of Food Safety and Food Aid (FAO), World Health Organization (WHO)

40 World Health Organisation/ International Programme on Chemical Safety (2000): Inventory of IPCS and other WHO pesticide evaluation and summary of toxicological evaluations performed by the Joint Meeting on Pesticide Residues (JMPR) through 2000, WHO/IPCS, Vienne, Switzerland

10 Endocrine Disruption

The issue of endocrine (hormone) disrupting effects of pesticides is a relatively new subject. Therefore there are no confirmed lists of pesticides with endocrine disrupting properties on an official national or international (e.g. WHO, EU) level. Only in the last ten years this issue has been addressed more intensively by a wide range of scientists in several organisations. It is important to notice that not even the endocrine system of the human body is fully understood, therefore the range of effects hormone mimicking or blocking chemicals may cause cannot yet be fully understood. This chapter attempts to summarise aspects of the existing knowledge on endocrine disrupting effects on humans and the environment.

In the human body two communication systems exist which regulate all responses and functions of the body: the endocrine system and the nervous system. The endocrine system functions through chemical messengers (hormones) which are produced by glands, whereas the nervous system functions through electrochemical messengers running along certain pathways to the brain and back to the peripheral nervous system. Hormones composed by the endocrine system instruct body cells more subtly and slowly than the messengers sent over the nervous system. There are several features of the endocrine system which make it a) very complex and complicated to understand, and b) susceptible to chemical input from the outside world. Hormones are specific, slow-acting chemical messengers which travel through the bloodstream and encounter special receptors.[41] Their effects usually continue in the body for long periods of time. The 'specific' nature of hormones is a particularly striking feature: this means that a hormone fits into a particular receptor, precisely as a key fits only the lock it is made for. This simple description is only a symbol. It does not depict the reality that, while many keys may fit into the lock, not all of them induce the appropriate effect, but may instead block the receptor.[42] However, the specification does not exclude a certain flexibility. A specific receptor can be present on different kinds of cells in different organs of the body, which means that a hormone which belongs to this receptor can be used by the body to achieve different effects in different tissues.[43] Hormones are responsible for the regulation of a large range of human activities and functions, including mutations in DNA nucleotides, biorhythm, mood, concentration of blood calcium and blood sugar, development of secondary sex characteristics and functioning of sex organs. Since certain hormones can alter gene expression and play important roles in regulating the growth and differentiation of cells, they are also involved in carcinogenesis. This is experimentally proven in cases of prostate and breast cancer. Possibilities of environmental contamination are of great concern, in that the introduction of very small amounts of chemicals can significantly effect hormones which play such an important part in the functioning of our bodies.

Most research dealing with endocrine disrupting chemicals has either been done on the alterations of reproductive organs or on the connection between cancer and hormones. As previously explained, hormones work with a kind of lock-key scheme and this is where environmental contaminants come into play. They may mimic other hormones, which means that there are suddenly "fake" hormones in the body which have not been induced by signals

41 McLachlan, J.A., Arnold, S.F.,(1996): Environmental Estrogens, American Scientist, accessible through http://www.amsci.org/amsci/articles/96articles/McLachla.html

42 Eubanks, M. W. (1997): Environmental Health Perspectives Volume 105, Number 5, National Institute Environmental Health Sciences (NIEHS), USA

43 ibid 41

from endocrine glands and which subsequently log on to the receptors and stimulate an effect. What puzzles scientists is the fact that chemicals which mimic hormones do not necessarily resemble the chemical structure of the hormone. Blocking a hormone from inducing an effect is another way environmental contaminants can act.

There is evidence that certain pesticides are endocrine disruptors, for example the organochlorine POPs pesticides DDT, dieldrin, toxaphene and chlordane, mirex, and endosulfan.26 These pesticides act as estrogens and can alter the sex organs and/or induce cancer. The high hazard potential of endocrine disrupting chemicals has been demonstrated in lab experiments, by incidents of contamination in wildlife, and by pesticide accidents. After exposure to estrogenic pollutants an effect called 'feminisation' occurred in wildlife: fish species and amphibia which were exposed developed more female offspring than usual, and experiments showed that eggs (turtle eggs in this case) exposed to estrogens only develop female offspring. As a result of an accident with Kepone (synonym chlordecone), exposed men had a lower sperm count. The dramatic decrease in sperm count in men all over the world may be due to unintentional exposure to endocrine disrupting chemicals.[44]

Unintentional endocrine disruption is a subtle and largely unknown process the symptoms of which may be apparent only decades later in humans and wildlife. Scientists all over the world have been alerted to these possible adverse effects.

In 2000, the European Union published a study: *Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting*.[45] In this study 564 substances were reviewed concerning their potential endocrine disrupting properties. The expert meeting created a list of 147 substances with endocrine disruption classifications. The expert also looked at the persistence of the substances and the exposure concern to those 147, which have been categorised. Appendix 3 list all ingredients authorized in Hungary, which have been reviewed by the EU, as well as those reviewed by other scientists.

Appendix 3 lists the ingredients authorized in Hungary and their potential to disrupt the endocrine system. In absence of existing official national or international sources, this list was compiled from other sources. So far only 78 ingredients are listed in Appendix 3. This low number does not mean that all other substances have no potential to act as endcrine disruptors, it reflects the small number of reviewed chemicals in general.

The issue of endocrine disruption extends the scope of this study by far. For further reading a short list of references is included in Appendix 3.

44 ibid 41

45 European Commission (2000): Towards the establishment of a priority list of substances fo further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting, Delft

Resources to endocrine disruption:

Selected world wide web resources on endocrine disruptors maintained by the National Resources Defense Council (NRDC): www.nrdc.org/health/effects/bendres.asp

Endocrine disruptor web site of U.S. EPA: www.epa.gov/scipoly/oscpendo/index.htm

Complete online book "Hormonally Active Agents in the Environment" (2000), 430 pages:

www.nap.edu/books/0309064198/html

Our Stolen Future - the leading work on the emerging scientific knowledge about hormone disruption: www.ourstolenfuture.com

11 Environmental Toxicity

141 ingredients authorized in Hungary are classified as "Dangerous for the Environment" and 136 have been assigned with the Symbol "N".

Pesticides can be released into the environment in many ways. Through run-off from fields they make their way into ditches, rivers, lakes. Ultimately, they reach the oceans through the water cycle. They may also leach into groundwater, which is then discharged into streams or is subsequently used for irrigation. Drift, evaporation and precipitation carry pesticides into both, nearby and far habitats. Via the foodchain accumulated in animal tissue, they can travel far distances and arrive at places in which they were never applied. Entire ecosystems are effected by the use of pesticide. Birds, mammals, insects and all other living creatures are poisoned either directly or indirectly by feeding upon poisoned food. They also experience reductions in food supply and habitat for both, themselves and their prey due to the extensive use of pesticides. Pesticides have always been created to do harm, and the chemical input into the environment is more pervasive and insidious than any other impact humans have had on their habitat. The fate and functioning of chemicals in the environment is still unknown to a great extent. The occurrence of multiple chemicals and their reactions with each other is another serious gap in the knowledge of modern science. Environmental symptoms such as a shift in sex ratios, cancer in wildlife animals, impaired fertility and/or other physical abnormalities can barely be explained at the current stage of scientific knowledge.[46] The few toxicity tests implemented for the pesticide registration process such as testing of the lethal concentration to certain fish species or waterfleas do not mimic reality at all. The following chapters present different approaches to assess the environmental impact of pesticides. The effects of endocrine disruption were already addressed separately in Chapter 10 because it effects human health as well as the environmental.

The summarised listings and categories of pesticide authorized in Hungary can be found in Appendix 4. A number of pesticide ingredients were excluded from the evaluation list, these are beneficial organism, inorganic compounds such as boric acid and ammonia, unclassified substances such as vegetable oil, waxes, glue, garlic, unclassified repellents, all adjuvants and all botanicals. Altogether 75 substances were excluded. The exclusion was done because toxicity information for most of these compound is not available.

46 Kegley, S., Neumeister, L., Martin, T., (1999): Disrupting the Balance, Ecological Impacts of Pesticides in California, Pesticide Action Network North America, Californians for Pesticide Reform, San Francisco, USA

11. 1 Classification of the European Union

11. 1. 1 Aquatic Environment

The major legislative framework in force dealing with dangerous substances in the European Union is the Council Directive 67/548/EEC of 27 June 1967, on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.[47] The classification of dangerous substances regarding their environmental hazards can be found in the amendment paper 393L002131[48] (Commission Directive 93/21/EEC of 27 April 1993), a modification to the directive 67/548/ EEC. The present criteria of this classification refer to aquatic ecosystems, but it is acknowledged that certain substances may affect other ecosystems as well. Table 21 displays the classification and the applied risk phrases valid in the European Union. The tests, on which this evaluation is based, are described in Annex V of the Directive 67/548 EEC. Amendments and modifications to this Annex were added and they can be found in separate documents. Comments on the determination of certain effects can be looked up in Document 393L0021.

Table 21: EU Classification: “Dangerous for the Environment” (aquatic)

Symbol	Acute Toxicity			Risk Phrase
	Fish LC_{50}[a], mg/L, 96h	Daphnia LC_{50}[b], mg/L, 96h	Algae IC_{50}[c], mg/L 72h	
N	1	1	1	R50
N	1	1	1	R50/53
N	1 ≥ 10	1 ≥ 10	1 ≥ 10	R51/53
-	10 ≥100	10 ≥100	10 ≥100	R52/53
-	-	-	-	R52

a. The LC_{50} = lethal concentration is defined as the amount of pesticide present per liter of aqueous solution that is lethal to 50% of the test organisms within the stated study time. Units are mg or µg of pesticide per liter of solution. Equivalent units are ppm (mg/L) and ppb (µg/L).
b. The EC_{50} = effective concentration of the pesticide in mg/L or µg/L that produces a specific measurable effect in 50% of the test organisms within the stated study time. The measurable effect is lethality for zooplankton and a reduction in photosynthetic activity by 50% for phytoplankton.
c. The IC_{50} = inhibitive concentration of the pesticide defined as the amount of pesticide present per liter of a solution that inhibits the growth of a algae culture by 50% within the stated study time.

R50: Very toxic to aquatic organisms
R51: Toxic to aquatic organisms
R52: Harmful to aquatic organisms
R53: May cause long-term adverse effects in the aquatic environment
Combined Risk Phrases should be read with a ‘comma’ between the phrases, as in R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

47 European Union (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium

48 European Union (1993): Document 393L0021, Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, reg lations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

For aquatic organisms tests are carried out using either static or flow-through methods. In the static method, the pesticide and test organisms are added to the test solution and kept there for the remainder of the experiment. In the flow-through method, a freshly prepared, pesticide-spiked test solution flows through the test chamber continuously for the duration of the test. The flow-through method provides a higher continuous dose of the pesticide; however, the static method does not remove waste products and may accumulate toxic breakdown products. Neither method exactly mimics a natural system. The EU recommends in Document 398L0073[49] from 1998 the flow-through method for fish according to the test method of the Organisation for Economic Co-operation and Development (OECD) TG 305, but also approves data from other test methods. For *daphnia* species (preferred *Daphnia magn*a, but *Daphnia pulex* is also possible) and algae (*Selenastrum capricornutum* and *Scenedesmus subspicatus*), the static method should apply. The Risk Phrase “R53: May cause long-term adverse effects in the aquatic environment” is applied to substances which are not readily degraded and therefore pose a long time threat to the environment. The test methods are described in Document 392L0069[50] 17th amendment of Directive 67/548 EEC. Please note that the test method for fish from Document 398L0073 replaces the test method from Document 392L0069.

The EU Symbols and Risk Phrases of the ingredients authorized in Hungary can be found in Appendix 4.

11. 1. 2 Terrestrial Environment

The EC also classifies substances according to the dangers they pose to environments other than the aquatic environment. If one of the following Risk Phrases apply to a substance the Symbol “N” for “Dangerous for the Environment” is to assign:

R54: Toxic to flora
R55: Toxic to fauna
R56: Toxic to soil organisms
R57: Toxic to bees
R58: May cause long-term adverse effects in the environment
R59: Dangerous for the ozone layer.

The EC does not require testing for those criteria and test methods have not been described in Document 392L0069. Document 393L0021 simply states that this classification is applicable when available evidence shows that pesticides may present a danger for ecosystems and that the criteria will be elaborated later. Classifying a substance as R59 occurs whether or not the substance is listed in Annex I Group I, II, III, IV and V to Council Regulation (EEC) No. 594/91 on substances that deplete the ozone layer.[51]

49 Europäische Gemeinschaft (1998): Dokument 398L0073, Richtlinie 98/73/EG der Kommission vom 18. September 1998 zur vierundzwanzigsten Anpassung der Richtlinie 67/548/EWG des Rates zur Angleichung der Rechts- und Verwaltungsvorschriften für die Einstufung, Verpackung und Kennzeichnung gefährlicher Stoffe an den technischen Fortschritt, Amtsblatt Nr. L 305 vom 16/11/1998, EG, Brüssel, Belgien

50 Europäische Gemeinschaft (1992): Dokument 392L0069, Richtlinie 92/69/EWG der Kommission vom 31. Juli 1992 zur siebzehnten Anpassung der Richtlinie 67/548/EWG des Rates zur Angleichung der Rechts- und Verwaltungsvorschriften für die Einstufung, Verpackung und Kennzeichnung gefährlicher Stoffe an den technischen Fortschritt Amtsblatt nr. L 383 vom 29/12/1992, EG, Brüssel, Belgien

11. 2 Environmental Impact Evaluation by Cornell University

The IPM Programme of Cornell University (New York) has developed an elaborated approach to assess the impact of pesticides and pest management practises on the environment. Information on physical properties, toxicities and environmental fate were gathered to develop a model called the Environmental Impact Quotient (EIQ). The equation used in calculating the EIQ is based upon the three components of agricultural production systems: a farm worker component, a consumer component, and an ecological component.[52]

Since the health hazards of the pesticides authorized in Hungary have already been described in the Chapter Human Toxicity, only the ecological component of the EIQ model will be used in this study. The EIQ model is built using a rating system: for each pesticide, parameter values between 1 to 5 according to the properties of the pesticide have been assigned. Low values mean low impact, high values the opposite. The parameter, the applied rating system and the main data sources are displayed in Table 22.

Table 22: Rating System for the Environmental Impact Quotient

Parameter	Rating System		Data Source
Mode of Action	non-systemic	1	EXTOXNET, CHEM-NEWS
	all herbicides	1	
	systemic	3	
Acute Dermal LD_{50} for Rabbits/ Rats	> 2000	1	EXTOXNET, CHEM-NEWS
	200 - 2000	3	
	200 - 5	5	
Long-Term Health Effects	little or none	1	EXTOXNET, CHEM-NEWS
	possible	3	
	definite	5	
Plant Surface Residue Half-life	l -2 weeks	1	EXTOXNET, CHEM-NEWS
	2 - 4 weeks	3	
	> 4 weeks	5	
	pre-emergent herbicides	1	
	post-emergent herbicides	3	
Soil Residue Half-life	< 30 days	1	USDA Agricultural Research Service and Soil Conservation Service
	30 - 100 days	3	
	> 100 days	5	

51 European Union (1993): Document 393L0021, Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

Please note all documents are available in multiple languages on the EC website; the prefix determines the document language e.g. en_392L0069.html, de_392L0069.html

52 IPM Programme, Cornell University, New York State Agricultural Experiment Station Geneva (1999):A Method to Measure the Environmental Impact of Pesticides, accessible through http://www.nysaes.cornell.edu/ipmnet/ny/Programme_news/EIQ.html, New York, USA

Table 22: Rating System for the Environmental Impact Quotient			
Parameter	Rating System		Data Source
Toxicity to Fish-96 hr LC_{50}	> 10 mg/l	1	EXTOXNET, CHEM-NEWS
	1 - 10 mg/l	3	
	< 1 mg/l	5	
Toxicity to Birds-8 day LC_{50}	> 1000 mg/l	1	EXTOXNET, CHEM-NEWS
	100 - 1000 mg/l	3	
	1 - 100 mg/l	5	
Toxicity to Bees	relatively nontoxic	1	New York State Pesticide Recommendations
	moderately toxic	3	
	highly toxic	5	
Toxicity to Beneficials	low impact	1	SELCTV (Oregon State)
	moderate impact	3	
	severe impact	5	
Groundwater and Runoff Potential	small	1	USDA Agricultural Research Service and Soil Conservation Service
	medium	3	
	large	5	

Within the components, individual factors are weighted differently. To give additional weight to individual factors, coefficients are used based on a one to five scale. Factors with the most weight are multiplied times five, medium-impact factors are multiplied times three and least-impact factors are multiplied times one. The exposure potential is expressed through factors as well, for example, fish toxicity is calculated by determining the toxicity of the pesticide to fish, times the probability (runoff potential) of the fish undergoing exposure to the pesticide.

Even when this model is quite comprehensive and closer to the real-life situation than other approaches to environmental assessment, there are a few inherent weaknesses: toxicities of algae and zooplankton, critical elements of the aquatic environment, have been left out; acute toxicity to mammals is only expressed as dermal $LD_{50,}$ (exposure through the skin) ; and toxicity to birds only as LC_{50} (lethal concentration). The last point is especially critical, since direct ingestion of contaminated food or granular forms of pesticides is often responsible for larger bird kills.[53] Potential endocrine disrupting effects have been left out in the model as well.

For 126 ingredients authorized in Hungary the ecological impact according to the model of Cornell University has been calculated. The list of the ingredients authorized in Hungary and their evaluation by Cornell University can be found in Appendix 4. The insecticides *propoxur, methamidophos, dimethoate, methidathion and esfenvalerate* are the pesticides with the highest ecological impact due to their high toxicity on bees, birds and beneficial organisms.

53 Kegley, S., Neumeister, L., Martin, T., (1999): Disrupting the Balance, Ecological Impacts of Pesticides in California, Pesticide Action Network North America, Californians for Pesticide Reform, San Francisco, USA

Resources to pesticides and environment:

Online database maintained by Pesticide Action Network North America. World wide the most comprehensive online database on pesticides: www.pesticideinfo.org

The U.S. EPA ECOTOX database provides single chemical toxicity information for aquatic and terrestrial life. ECOTOX is a useful tool for examining impacts of chemicals on the environment: www.epa.gov/ecotox

The EXTension TOXicology NETwork (EXTOXNET) is an effort of University of California, Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho. Pesticide Information Profiles (PIPs) are documents which provide specific pesticide information relating to health and environmental effects:

http://ace.orst.edu/info/extoxnet

12 Pesticides in Food and Water

Residue data are used in order to estimate the environmental and human exposure to pesticides. In absence of Polish monitoring data, German data were used in this study. The collection of German residue data resulted in a list of 149 different pesticides detected in Germany. 87 of these pesticides are also authorized in Hungary and may, under similiar conditions, also cause residues in Polish food and waters.

Data on German pesticide residues in food were obtained from the German Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV). The BgVV started its current monitoring programme in 1995, based upon a 'Foodstuff Basket' which represents the entire food market in Germany. Every year until 2001 a new fraction of this 'Foodstuff Basket' has been analysed. According to a monitoring plan, approximately 4600 samples (domestic and foreign) are analysed each year by the federal states. The BgVV collects the data annually from the federal states and publishes them in the internet[54] and as hard copies.

The BgVV analyses different substances in different foodstuffs. Food with animal origin is tested for heavy metals, persistent organochlorine compounds (DDT and its metabolites, Dieldrin, Endrin, HCH etc.), PCB, moschus compounds and bromocycles. Food with plant origin is tested for pesticides, myco toxins, nitrate and plant surface treatment substances and heavy metals.

There are several criteria by which the BgVV chooses the pesticides to be determined:

- registration status
- acceptable daily intake (ADI) according to the World Health Organisation (WHO)
- experience
- maximum residue level (MRL)
- applicability of multiresidue method S 19, a detection method commonly used in Germany

Only data from samples with plant origin and with origin in Germany were included in the data collection. The latest data available are from the year 2000. Monitoring data from the year 1997 through 2000, in this time span 26 food stuffs e.g. crops were monitored.

54 Website of the BgVV: http://www.BgVV.de/fbs/fb1/lebensmittel/monitor.htm

Only samples with quantifiable detections were considered. The concentration of a detected residue relates to several factors, e.g. the time span between the sampling and the last application of the pesticide, the chemical and physical properties of the pesticide, the weather conditions after the application, but less to the amount applied. Information on the quantity was therefore neglected. The number of detections of a pesticide was also not considered, because the monitoring data only represent a small number of relative randomly taken foodstuffs. This means that all quantifiable pesticide residues, independent of amount and number, were used in this study. Myco toxins, nitrat and plant surface treatment substances as well as heavy metals were excluded.

Groundwater

The Federal Working Group on Water (LAWA) collects data on water quality from all federal states and publishes them. The last report on pesticides in the groundwater was published in 1997 and contains data from the time span 1990 through 1995.[55] Those data were considered outdated, therefore the responsible federal state agencies were contacted and recent data were requested. The following states (out of 16) submitted recent data:

- Niedersachen (1997- 1998)
- Sachen-Anhalt (1997-1999)
- Sachsen (1997-1999)
- Schleswig-Holstein (1997-1999)
- Berlin[56] (1997 -2001)
- Bremen (1999)
- Nordrhein-Westfalen (1997-2001)
- Hamburg (1998, 1999)
- Bavaria (2000)

The concentration of residues in groundwater relates to several factors, for example the time span between the sampling and the last application of the pesticide, the amounts applied, soil structure (biological activity, structure), precipitation and the environmental behaviour of the substance. Therefore, information on the concentration was neglected. Any residue reported to be found in groundwater was used in this study.

Surface Water

There are several organisations, which sample pesticides in surface water. Federal states which have big streams in their area usually monitor pesticides on a regular schedule and publish Water Quality Reports. Some of those Water Quality Reports include CD ROMs with databases, some exist as hardcopy versions. Water Quality Reports from Nordrhein-Westfalen, Baden-Württemberg and Rheinland-Pfalz were obtained to get information on pesticides in the river Rhine. Data on pesticides in the river Elbe were obtained from the Working Group for a Clean Elbe (ARGE). Data on pesticides in the river Weser were obtained from the Working Group for a Clean Weser. Those working groups are founded and maintained by institutions of the federal states, which are concerned with the water quality in these rivers.

Additionally, all federal states were contacted and asked to submit data.

Appendix 5 lists 92 pesticides detected as residues in German food and water, which are authorized as pesticide in Hungary.

55 Länderarbeitsgemeinschaft Wasser (1997): Bericht zur Grundwasserbeschaffenheit - Pflanzenschutzmittel -, Kulturbuchverlag Berlin GmbH, Berlin, Germany

56 Only very few pesticides were tested, mostly organochlorines.

12. 1 Limits of Monitoring Data

Monitoring data are a valuable source of information. However, there are a number of factors, which make the assessment of residue data difficult:

- monitoring programmes can only detect the pesticides which are looked for,
- in general, sampling in Germany does not correlate with the time of application and does not relate to the amounts of pesticides actually applied,
- the detected concentration depends on the time span between sampling and application,
- water monitoring programmes differ considerably from state to state.

Other major data gaps are related to the detection methods, which:

- do not cover all pesticides in food due to inexpensive and practical multi method technologies,
- are very expensive for some substances and therefore not used on a larger scale,1[57]
- typically extract only 30-90% of the residues present,[58]
- do not cover all breakdown products,
- do not cover 'inert' ingredients,[59] and
- may vary from year to year due to improved technologies, that can detect lower concentrations.

Actual pesticide use data are needed to develop targeted monitoring programme, and to evaluate pesticide use. In the US. States California and Oregon, any application of a pesticide with commercial intention has to be reported to governmental agencies. California use data have been used for a wide variety of purposes. A thorough analysis of the pesticide use reporting (PUR) systems in California and Oregon was published by PAN Germany in January 2002.[60] This report shows how pesticide use data are utilised for the analysis of trends and statistics by crop, region, ingredient and product. They are also used for the protection of ground and surface water, for risk assessment, for epidemiological studies and for the evaluation of pest management practices. A proceeding study published by PAN Germany in June 2002, presents and discusses options and possibilities for pesticide use reporting (PUR) systems in the European Union.[61]

57 Personal communication with Dr. Domroese, Environmental Agency of Hamburg

58 Kegley, S. E., Neumeister, L., Martin, T., (1999): Disrupting the Balance, Ecological Impacts of Pesticides in California, Pesticide Action Network North America, Californians for Pesticide Reform, San Francisco, USA

59 Pesticide products contain active and 'inert' ingredients, which are substances which can enhance the efficiency of the active ingredient, make a product more degradable or easier to use. 'Inerts' are mostly handled as trade secrets of the manufacturer which means they are not labelled on the product.

60 Neumeister, L. (2002): Pesticide Use Reporting - Legal Framework, Data Processing and Utilisation, Part One Full Reporting Systems in California and Oregon, Pesticide Action Network Germany, Hamburg, Germany

61 Neumeister, L. (2003): Pesticide Use Reporting - Options and Possibilities for Europe, Pesticide Action Network Germany, Hamburg, Germany

Resources to pesticide residues in food:

European Commission website presents result of national monitoring programme:

http://europa.eu.int/comm/food/fs/ph_ps/pest/index_en.htm

The European Commission operates an EU Rapid Alert System for Food. This provides the information on cases where high residues of pesticides have been found in imported samples: http://www.pesticides.gov.uk/citizen/residues/other/other_residues.htm

13 Summary

Agriculture plays an important role in Hungary. The country is a net-exporter of agricultural products, and some 8% of the employed population works in the agricultural sector. Organic agriculture is rising and will presumably continue to rise due to agri-environment funds and improved marketing.

Hungary maintains a pesticide sales reporting system, based upon retail sales but recent sales data are not available.

In the year 2000 some 360 pesticide active ingredients, plant growth regulators and other substance used in crop protection were registered in Hungary. The evaluation of these substances according to international classification system shows that:

- 7 substances are priority substances according to the European Water Framework Directive;
- 5 are PIC pesticides or PIC candidates;
- 7 are extremely hazardous, 15 are highly hazardous, 57 are moderately hazardous, 57 are slightly hazardous and 110 are unlikely to present hazard in normal use according to the WHO;
- 25 are very toxic, 34 are toxic, 87 are harmful and 19 are irritant according to the European Union;
- 39 of the ingredients authorized in Hungary are cholinesterase inhibitors (ChE);
- from 25 of the ingredients authorized in Hungary, which are evaluated by the IARC 7 are possibly carcinogenic to humans and 18 are considered as not classifiable as carcinogenic to humans;
- 17 of the ingredients authorized in Hungary cause concern for humans due to possible carcinogenic effects and have been placed into the carcinogenicity category 3 by the EU. 1 may cause heritable genetic damage; 10 cause concern for humans owing to possible mutagenic effects and have been placed into the mutagenicity category 3; and 5 may cause harm to the unborn child and 10 present possible risks of harm to the unborn child and that
- 141 ingredients authorized in Hungary are classified as “Dangerous for the Environment” and 136 have been assigned with the Symbol “N”.

With accession to the European Union in 2004 and in compliance with EU Directive 91/414 EC authorization for 69 active ingredients will expire in Hungary.

Appendix 1 - Identification and Regulatory Status

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
fenazaquin	120928-09-8	410-580-0	8149	AC	Unclassified	notified		
fenbutatin-oxide	13356-08-6	236-407-7	359	AC	Organotin	notified		
tebufenpyrad	119168-77-3	-	8320	AC	Pyrazole	notified		
tetradifon	116-29-0	-	113	AC	Unclassified	out		
dinocap	39300-45-3	254-408-0	98	AC, FU	Dinitrophenol derivative	pending		
amitraz	33089-61-1	251-375-4	362	AC, IN	Formamidine	pending		
bromopropylate	18181-80-1	-	503	AC, IN	Unclassified	out 7/03		
clofentezine	74115-24-5	-	418	AC, IN	Unclassified	notified		
cyhexatin	13121-70-5	236-049-1	289	AC, IN	Organotin	notified		
DDVP (dichlorvos)	62-73-7	200-547-7	11	AC, IN	Organophosphorus	notified		
endosulfan	115-29-7	204-079-4	89	AC, IN	Organochlorine	pending	PD	
flufenoxuron	101463-69-8	-	470	AC, IN	Benzoylurea	notified		
lambda cyhalothrin	91465-08-6	415-130-7	463	AC, IN	Pyrethroid	Annex I		
malathion	121-75-5	204-497-7	12	AC, IN	Organophosphorus	notified		
propargite	2312-35-8	219-006-1	216	AC, IN	Unclassified	notified		
aldicarb	116-06-3	204-123-2	215	AC, IN, NE	N-Methyl Carbamate	pending		
phosalone	2310-17-0	218-996-2	109	AC,IN	Organophosphorus	notified		
pirimiphos-methyl	29232-93-7	249-528-5	239	AC,IN	Organophosphorus	notified		
pyridaben	96489-71-3	405-700-3	583	AC,IN	Unclassified	notified		
permethrin	52645-53-1	258-067-9	331	AD,IN,AC	Pyrethroid	out 12/03		
boric acid	10043-35-3	-	8033	BA, FU	Inorganic	not listed		
copper hydroxide	20427-59-2	-	8074	BA, FU	Inorganic-Copper	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
copper oxychloride	1332-40-7	-	8076	BA, FU	Inorganic-Copper	notified		
TPA	2136-79-0	-	-	Break-down product	Unclassified	not listed		
1,1'-(iminobis(octamethyl-ene)diguanidine	13516-27-3	-	531	FU	Guanidine	out 7/03		
acibenzolar-s-methyl	135158-54-2	420-050-0	-	FU	Unclassified	not listed		
azoxystrobin	131860-33-8	-	571	FU	Strobin	Annex I (new ai)		
benalaxyl	71626-11-4	-	416	FU	Xylylalanine	pending		
benomyl	17804-35-2	241-775-7	206	FU	Benzimidazole	out 5/03		PIC*
bitertanol	55179-31-2	-	386	FU	Azole	notified		
bromuconazole	116255-48-2	-	8036	FU	Azole	notified		
bupirimate	41483-43-6	-	261	FU	Pyrimidine	notified		
captan	133-06-2	205-087-0	40	FU	Thiophthalimide	notified		
carbendazim	10605-21-7	234-232-0	263	FU	Benzimidazole	pending		
carboxin	5234-68-4	-	273	FU	Carboxamide	notified		
chlorothalonil	1897-45-6	217-588-1	288	FU	Substituted Benzene	pending		
copper 8-quinolinoleate	10380-28-6	-	8240	FU	Inorganic-Copper	out 7/03		
copper sulfate (anhydrous)	7758-98-7	231-847-6	-	FU	Inorganic-Copper	not listed		
cymoxanil	57966-95-7	261-043-0	419	FU	Unclassified	notified		
cyproconazole	94361-06-5	-	600	FU	Azole	notified		
cyprodinil	121552-61-2	-	511	FU	Unclassified	notified		
dichlofluanid	1085-98-9	214-118-7	74	FU	Unclassified	out 7/03		
diclobutrazol	75736-33-3	-	421	FU	Unclassified	out 7/03		
difenoconazole	119446-68-3	-	8107	FU	Azole	notified		
dimethomorph	110488-70-5	404-200-2	483	FU	Morpholine	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
diniconazole	83657-18-5	-	8117	FU	Azole	notified		
dinitro cresol	534-52-1	208-601-1	-	FU	Dinitrophenol derivative	not listed		
diphenylamine	122-39-4	204-539-4	460	FU	Unclassified	notified		
dithianon	3347-22-6	222-098-6	153	FU	Unclassified	notified		
dodine	2439-10-3	219-459-5	101	FU	Guanidine	notified		
epoxiconazole	106325-08-0	406-850-2	609	FU	Unclassified	notified		
ethoxyquin	91-53-2	202-075-7	517	FU	Unclassified	not listed		
famoxadone	131807-57-3	-	-	FU	Unclassified	new ai, prov. 18.4.2003		
fenarimol	60168-88-9	262-095-7	380	FU	Pyrimidine	pending		
fenhexamid	126833-17-8	-	-	FU	Unclassified	not listed		
fenpiclonil	74738-17-3	-	519	FU	Unclassified	out 7/03		
fenpropimorph	67564-91-4	266-719-9	-	FU	Morpholine	not listed		
fentin hydroxide	76-87-9	200-990-6	490	FU	Organotin	out 12/02		
fluazinam	79622-59-6	-	521	FU	2,6-Dinitroaniline	notified		
fludioxonil	131341-86-1	-	522	FU	Unclassified	notified		
fluquinconazole	136426-54-5	411-960-9	474	FU	Azole	notified		
flusilazole	85509-19-9	-	435	FU	Azole	pending		
flutriafol	76674-21-0	-	436	FU	Azole	notified		
folpet	133-07-3	205-088-6	75	FU	Thiophthalimide	notified		
fosetyl-al	39148-24-8	-	384	FU	Unclassified	notified		
fuberidazole	3878-19-1	223-404-0	525	FU	Benzimidazole	notified		
guazatine	108173-90-6	236-855-3	361	FU	Guanidine	notified		
hexaconazole	79983-71-4	-	465	FU	Azole	notified		
hymexazol	10004-44-1	233-000-6	528	FU	Unclassified	notified		
imazalil	35554-44-0	252-615-0	335	FU	Azole	Annex I		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
iprodione	36734-19-7	253-178-9	278	FU	Dicarboximide	Annex I		
iprovalicarb	140923-17-7	-	-	FU	Unclassified	new ai		
kasugamycin	6980-18-3	-	8196	FU	Unclassified	notified		
kresoxim-methyl	143390-89-0	-	568	FU	Strobin	Annex I (new ai)		
mancozeb	10004-44-1	-	34	FU	Dithiocarbamate	pending		
metalaxyl	57837-19-1	-	365	FU	Xylylalanine	out		
metconazole	125116-23-6	-	8210	FU	Azole	notified		
metiram	9006-42-2	-	478	FU	Dithiocarbamate	pending		
myclobutanil	88671-89-0	-	442	FU	Azole	notified		
nuarimol	63284-71-9	-	443	FU	Pyrimidine	notified		
oxycarboxin	5259-88-1	226-066-2	274	FU	Carboxamide	out 7/03		
penconazole	66246-88-6	-	446	FU	Azole	notified		
pencycuron	66063-05-6	-	402	FU	Urea	notified		
primisulfuron	113036-87-6	-	-	FU	Inorganic	not listed		
prochloraz	67747-09-5	266-994-5	407	FU	Azole	notified		
procymidone	32809-16-8	-	383	FU	Unclassified	pending		
propamocarb hydrochloride	25606-41-1	-	-	FU	Other Carbamate	not listed		
propiconazole	60207-90-1	-	408	FU	Azole	pending		
propineb	12071-83-9	-	177	FU	Dithiocarbamate	not listed		
pyrimethanil	53112-28-0	-	8270	FU	Pyrimidine	notified		
quinoxyfen	124495-18-7	-	-	FU	Unclassified	new ai		
spiroxamine	118134-30-8	-	-	FU	Unclassified	Annex I (new ai)		
sulfur	7704-34-9	-	18	FU	Inorganic	not listed		
tebuconazole	107534-96-3	-	494	FU	Azole	notified		
tetraconazole	112281-77-3	407-760-7	8323	FU	Azole	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
thiabendazole	148-79-8	205-725-8	323	FU	Benzimidazole	Annex I		
thiophanate-methyl	23564-05-8	245-740-7	262	FU	Benzimidazole	pending		
tolylfluanid	731-27-1	211-986-9	275	FU	Unclassified	notified		
triadimefon	43121-43-3	256-103-8	352	FU	Azole	notified		
triadimenol	55219-65-3	-	398	FU	Azole	notified		
tridemorph	81412-43-3	-	-	FU	Morpholine	not listed		
trifloxystrobin	141517-21-7	-	-	FU	Strobin	not listed		
triflumizole	68694-11-1	-	8346	FU	Azole	notified		
triforine	26644-46-2	-	360	FU	Unclassified	out 7/03		
triphenyltin acetate	900-95-8	212-984-0	489	FU	Organotin	out 12/02		
triticonazole	131983-72-7	-	652	FU	Azole	notified		
vinclozolin	50471-44-8	256-599-6	280	FU	Dicarboximide	pending		
zineb	12122-67-7	235-180-1	25	FU	Dithiocarbamate	out 3/01		
ziram	137-30-4	205-288-3	31	FU	Dithiocarbamate	pending		
dazomet	533-74-4	208-576-7	146	FU, IN, NE, HB,	Unclassified	notified		
aluminum phosphide	20859-73-8	244-088-0	227	FUM	Inorganic	notified		
magnesium phosphide	12057-74-8	235-023-7	228	FUM	Inorganic	notified		
metam sodium, dihydrate	137-42-8	205-293-0	-	FUM, NE	Dithiocarbamate	not listed		
2,4-D	94-75-7	202-361-1	1	HB	Chlorophenoxy acid or ester	Annex I		
acetochlor	34256-82-1	251-899-3	496	HB	Chloroacetanilide	notified		
acifluorfen, sodium salt	62476-59-9	-	-	HB	Diphenyl ether	not listed		
alachlor	15972-60-8	240-110-8	204	HB	Chloroacetanilide	pending	P	
amidosulfuron	120923-37-7	-	515	HB	Sulfonylurea	notified		
asulam	3337-71-1	-	240	HB	Other Carbamate	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
atrazine	1912-24-9	217-617-8	91	HB	Triazine	pending	PD	
azafenidin	68049-83-2	-	-	HB	Unclassified	new ai		
benfluralin	1861-40-1	-	285	HB	2,6-Dinitroaniline	notified		
bensulfuron methyl	83055-99-6	401-340-6	-	HB	Sulfonylurea	not listed		
bentazone	25057-89-0	246-585-8	366	HB	Unclassified	Annex I		
benzoylprop ethyl	22212-55-1	244-845-5	229	HB	Arylalanine	out 7/03		
bifenox	42576-02-3	-	413	HB	Diphenyl ether	notified		
bromoxynil phenol	1689-84-5	216-882-7	87	HB	Hydroxybenzonitrile	pending		
butylate	2008-41-5	-	266	HB	Thiocarbamate	out 7/03		
carfentrazone-ethyl	128639-02-1	-	-	HB	Unclassified	new ai, prov. 18.4.2004		
chlorbromuron	13360-45-7	-	186	HB	Urea	out 7/03		
chlorotoluron	15545-48-9	-	217	HB	Urea	pending		
chloroxuron	1982-47-4	-	187	HB	Urea	out 7/03		
chlorsulfuron	64902-72-3	265-268-5	391	HB	Sulfonylurea	notified		
cinidon-ethyl	142891-20-1	-	-	HB	Unclassified	new ai		
clethodim	99129-21-2	-	508	HB	Cyclohexenone derivative	notified		
clomazone	81777-89-1	-	509	HB	Unclassified	notified		
clopyralid	1702-17-6	216-935-4	455	HB	Pyridinecarboxylic acid	notified		
cyanazine	21725-46-2	244-544-9	230	HB	Triazine	out		
cycloate	1134-23-2	-	214	HB	Thiocarbamate	out 7/03		
cycloxydim	101205-02-1	-	510	HB	Cyclohexenone derivative	notified		
desmedipham	13684-56-5	-	477	HB	Bis-Carbamate	pending		
dicamba	1918-00-9	217-635-6	85	HB	Benzoic acid	notified		
dichlobenil	1194-65-6	214-787-5	73	HB	Substituted Benzene	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
diclofop-methyl	51338-27-3	257-141-8	-	HB	Aryloxyphenoxy propionic acid	not listed		
difenzoquat	49866-87-7	-	367	HB	Unclassified	out 7/03		
dimethachlor	50563-36-5	256-625-6	8112	HB	Chloroacetanilide	notified		
dimethenamid	87674-68-8	-	654	HB	Amide	notified		
diphenamid	957-51-7	213-482-4	372	HB	Amide	out 7/03		
diquat dibromide	85-00-7	201-579-4	55	HB	Bipyridylium	Annex I		
diuron	330-54-1	206-354-4	100	HB	Urea	notified	PD	
EPTC	759-94-4	212-073-8	155	HB	Thiocarbamate	out 7/03		
ethalfluralin	55283-68-6	-	516	HB	2,6-Dinitroaniline	notified		
ethofumesate	26225-79-6	247-525-3	233	HB	Unclassified	Annex I		
ethoxyfen-ethyl	131086-42-5	-	-	HB	Unclassified	not listed		
fenitropan	65934-94-3	-	-	HB	Nitrophenyl ether	not listed		
fenoxaprop-p (+)	71283-80-2	-	484	HB	Aryloxyphenoxy propionic acid	notified		
fenoxaprop-p (+/-)	66441-23-4	266-362-9	424	HB	Aryloxyphenoxy propionic acid	out 7/03		
fenuron	101-42-8	-	158	HB	Urea	out 7/03		
ferrous sulfate heptahydrate	7782-63-0	-	-	HB	Inorganic	not listed		
flamprop-isopropyl	52756-22-6	-	-	HB	Arylalanine	not listed		
flazasulfuron	104040-78-0	-	-	HB	Unclassified	not listed		
florasulam	145701-23-1	-	-	HB	Triazolopyrimidine	not listed		
fluazifop-butyl	69806-50-4	274-125-6	-	HB	Aryloxyphenoxy propionic acid	not listed		
fluazifop-p-butyl	79241-46-6	-	467	HB	Aryloxyphenoxy propionic acid	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
flucycloxuron	113036-88-7	-	473	HB	Benzoylurea	out 7/03		
flufenacet	142459-58-3	-	-	HB	Anilide	not listed		
flufenzine	162320-67-4	-	-	HB	Amide	not listed		
flumioxazin	103361-09-7	-	-	HB	Unclassified	not listed		
fluorochloridone	61213-25-0	-	430	HB	Unclassified	notified		
fluoroglycofen	77501-60-1	-	523	HB	Diphenyl ether	out 7/03		
flupyrsulfuron-methyl, sodium salt	144740-54-5	-	-	HB	Sulfonylurea	not listed		
flurenol	467-69-6	207-397-1	304	HB	Unclassified	notified		
fluroxypyr	69377-81-7	-	431	HB	Unclassified	Annex I		
fluroxypyr 1-methylheptyl ester	81406-37-3	279-752-9 [1]	-	HB	Unclassified	not listed		
fomesafen	72178-02-0	276-439-9	8162	HB	Diphenyl ether	out 7/03		
fosamine, ammonium salt	25954-13-6	-	344	HB	Unclassified	out 7/03		
glufosinate-ammonium	77182-82-2	278-636-5	437	HB	Unclassified	notified		
glyphosate	1071-83-6	213-997-4	284	HB	Phosphonoglycine	Annex I		
glyphosate-trimesium	81591-81-3	-	-	HB	Phosphonoglycine	not listed		
haloxyfop (unstated stereochemistry)	69806-34-4	-	438	HB	Aryloxyphenoxy propionic acid	out 7/03		
haloxyfop-r	72619-32-0	406-250-0	526	HB	Aryloxyphenoxy propionic acid	notified		
hexazinone	51235-04-2	257-074-4	347	HB	Triazinone	out 7/03		
imazamethabenz	81405-85-8	-	529	HB	Imidazolinone	notified		
imazamox	114311-32-9	-	-	HB	Imidazolinone	new ai		
imazapyr	81334-34-1	-	530	HB	Imidazolinone	out 7/03		
imazaquin	81335-37-7	-	8182	HB	Imidazolinone	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
imazethapyr	81335-77-5	-	8184	HB	Imidazolinone	notified		
iminoctadine	39202-40-9	-	-	HB	Chloroacetanilide	not listed		
iodosulfuron methyl, sodium salt	144550-36-7	-	-	HB	Sulfonylurea	not listed		
ioxynil	1689-83-4	216-881-1	86	HB	Hydroxybenzonitrile	pending		
isopropalin	33820-53-0	-	532	HB	2,6-Dinitroaniline	out 7/03		
isoproturon	34123-59-6	251-835-4	336	HB	Urea	Annex I	PD	
isoxaben	82558-50-7	-	8194	HB	Amide	notified		
isoxaflutole	141112-29-0	-	-	HB	Unclassified	new ai, prov. 18.4.2005		
lenacil	2164-08-1	-	163	HB	Uracil	notified		
linuron	330-55-2	206-356-5	76	HB	Urea	Annex I		
maleic hydrazide k salt	51542-52-0	-	-	HB	Anilide	not listed		
MCPA	94-74-6	202-360-6	2	HB	Chlorophenoxy acid or ester	pending		
MCPB	94-81-5	202-365-3	50	HB	Chlorophenoxy acid or ester	pending		
MCPP	7085-19-0	202-264-4	51	HB	Chlorophenoxy acid or ester	pending		
mecoprop-p	16484-77-8	-	475	HB	Chlorophenoxy acid or ester	pending		
metamitron	41394-05-2	255-349-3	381	HB	Triazinone	notified		
metazachlor	67129-08-2	-	411	HB	Chloroacetanilide	notified		
metobromuron	3060-89-7	-	168	HB	Urea	out 7/03		
metolachlor	51218-45-2	-	400	HB	Chloroacetanilide	out 7/03		
metolachlor, (s)	87392-12-9	-	-	HB	Chloroacetanilide	not listed		
metoxuron	19937-59-8	243-433-2	219	HB	Urea	out 7/03		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
metribuzin	21087-64-9	244-209-7	283	HB	Triazinone	notified		
molinate	2212-67-1	218-661-0	235	HB	Thiocarbamate	pending		
napropamide	15299-99-7	-	271	HB	Amide	notified		
naptalam	132-66-1	-	8227	HB	Amide	out 7/03		
nicosulfuron	111991-09-4	-	8228	HB	Sulfonylurea	notified		
oxyfluorfen	42874-03-3	-	538	HB	Diphenyl ether	notified		
pendimethalin	40487-42-1	254-938-2	357	HB	2,6-Dinitroaniline	pending		
phenmedipham	13684-63-4	-	77	HB	Bis-Carbamate	pending		
phthalanilic acid	4727-29-1	-	-	HB	Urea	not listed		
polyoxin b	19396-06-6	-	-	HB	Unclassified	not listed		
prometryn	7287-19-6	-	93	HB	Triazine	out		
propachlor	1918-16-7	217-638-2	176	HB	Chloroacetanilide	notified		
propanil	709-98-8	211-914-6	205	HB	Anilide	notified		
propaquizafop	111479-05-1	-	8260	HB	Aryloxyphenoxy propionic acid	notified		
propisochlor	86763-47-5	-	-	HB	Thiocarbamate	not listed		
propyzamide	23950-58-5	245-951-4	315	HB	Amide	pending		
prosulfuron	94125-34-5	-	-	HB	Sulfonylurea	new ai, prov. 18.4.2002		
pyraflufen	129630-17-7	-	-	HB	Sulfonylurea	not listed		
pyrazon	1698-60-8	216-920-2	111	HB	Pyridazinone	notified		
pyridate	55512-33-9	259-686-7	447+B 721	HB	Unclassified	Annex I		
quinclorac	84087-01-4	402-780-1	493	HB	Unclassified	notified		
quinmerac	90717-03-6	-	563	HB	Unclassified	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
quizalofop-ethyl	76578-14-8	-	-	HB	Aryloxyphenoxy propionic acid	not listed		
quizalofop-p	94051-08-8	-	641	HB	Aryloxyphenoxy propionic acid	notified		
quizalofop-p-tefuryl	119738-06-6	414-200-4	-	HB	Aryloxyphenoxy propionic acid	not listed		
rimsulfuron	122931-48-0	-	8278	HB	Sulfonylurea	notified		
sethoxydim	74051-80-2	-	401	HB	Cyclohexenone derivative	out 7/03		
sulfosulfuron	141776-32-1	-	-	HB	Sulfonylurea	new ai		
terbacil	5902-51-2	-	272	HB	Uracil	out 7/03		
terbutryn	886-50-0	-	212	HB	Triazine	out		
thifensulfuron-methyl	79277-27-3	-	-	HB	Sulfonylurea	not listed		
thiobencarb	28249-77-6	248-924-5	388	HB	Thiocarbamate	notified		
tralkoxydim	87820-88-0	-	544	HB	Cyclohexenone derivative	notified		
triasulfuron	82097-50-5	-	480	HB	Sulfonylurea	Annex I		
tribenuron methyl	101200-48-0	401-190-1	546	HB	Sulfonylurea	notified		
triclopyr	55335-06-3	-	376	HB	Chloropyridinyl	notified		
trifluralin	1582-09-8	216-428-8	183	HB	2,6-Dinitroaniline	notified	PD	
triflusulfuron-methyl	126535-15-7	-	8347	HB	Sulfonylurea	notified		
vaseline oil	92145-74-4	-	-	HB	Sulfonylurea	not listed		
vernolate	1929-77-7	217-681-7	237	HB	Thiocarbamate	out 7/03		
terbuthylazine	5915-41-3	-	234	HB, AG	Triazine	notified		
methyl bromide	74-83-9	200-813-2	128	HB,AC,IN, NE,FU,RO	Halogenated organic	notified		
buprofezin	69327-76-0	-	8038	IGR	Unclassified	notified		
hexythiazox	78587-05-0	-	439	IGR, AC	Unclassified	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
acephate	30560-19-1	250-241-2	338	IN	Organophosphorus	out		
acetamiprid	135410-20-7	-	-	IN	Chloro-nicotinyl	new ai		
avermectin	71751-41-2	-	495	IN	Botanical	notified		
azinphos-methyl	86-50-0	201-676-1	37	IN	Organophosphorus	pending		
barium polysulfide	50864-67-0	256-814-3	-	IN	Inorganic	out 7/03		
bendiocarb	22781-23-3	245-216-8	232	IN	N-Methyl Carbamate	out 7/03		
benfuracarb	82560-54-1	-	501	IN	Other Carbamate	notified		
bensultap	17606-31-4	-	464	IN	Unclassified	out 7/03		
beta-cyfluthrin	68359-37-5	269-855-7	482	IN	Pyrethroid	pending		
butocarboxim	34681-10-2	252-139-3	378	IN	N-Methyl Carbamate	out 7/03		
carbaryl	63-25-2	200-555-0	26	IN	N-Methyl Carbamate	notified		
carbosulfan	55285-14-8	259-565-9	417	IN	N-Methyl Carbamate	notified		
cartap monohydrochloride	15263-52-2	239-309-2	-	IN	Unclassified	not listed		
chlorfluazuron	71422-67-8	-	8057	IN	Unclassified	out 7/03		
chlorpyrifos	2921-88-2	220-864-4	221	IN	Organophosphorus	pending	PD	
chlorpyrifos-methyl	5598-13-0	-	486	IN	Organophosphorus	pending		
cyfluthrin	68359-37-5	269-855-7	385	IN	Pyrethroid	pending		
cypermethrin (stereochemistry unspecified)	52315-07-8	-	-	IN	Pyrethroid	notified		
cypermethrin, alpha	67375-30-8	-	332	IN	Pyrethroid	pending		
cypermethrin, beta	65731-84-2	-	-	IN	Pyrethroid	not listed		
deltamethrin	52918-63-5	258-256-6	333	IN	Pyrethroid	Annex I		
diazinon	333-41-5	206-373-8	15	IN	Organophosphorus	notified		
diflubenzuron	35367-38-5	-	339	IN	Benzoylurea	notified		
dimethoate	60-51-5	200-480-3	59	IN	Organophosphorus	notified		
dioxacarb	6988-21-2	230-253-4	8120	IN	N-Methyl Carbamate	out 7/03		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
esfenvalerate	66230-04-4	-	481	IN	Pyrethroid	Annex I		
ethofenprox	80844-07-1	-	471	IN	Unclassified	notified		
etrimfos	38260-54-7	253-855-9	379	IN	Organophosphorus	out 7/03		
fenitrothion	122-14-5	204-524-2	35	IN	Organophosphorus	notified		
fenoxycarb	72490-01-8	276-696-7	425	IN	Other Carbamate	notified		
fenpryroximate	134098-61-6	-	8152	IN	Unclassified	notified		
fenthion	55-38-9	200-231-9	79	IN	Organophosphorus	pending		
fipronil	120068-37-3	-	581	IN	Unclassified	notified		
heptenophos	23560-59-0	245-737-0	527	IN	Organophosphorus	out 7/03		
hexaflumuron	86479-06-3	-	8176	IN	Benzoylurea	notified		
imidacloprid	138261-41-3	-	-	IN	Chloro-nicotinyl	not listed		
indoxycarb	173584-44-6	-	-	IN	Unclassified	not listed		
lufenuron	103055-07-8	410-690-9	8203	IN	Benzoylurea	notified		
methamidophos	10265-92-6	233-606-0	355	IN	Organophosphorus	pending		PIC
methidathion	950-37-8	213-449-4	193	IN	Organophosphorus	out		
methomyl	16752-77-5	240-815-0	264	IN	N-Methyl Carbamate	notified		
methyl parathion	298-00-0	206-050-1	487	IN	Organophosphorus	out		PIC
mineral oil	8012-95-1	-	-	IN	Petroleum derivative	not listed		
oxythioquinox	2439-01-2	219-455-3	172	IN	Unclassified	out 7/03		
phenthoate	2597-03-7	219-997-0	108	IN	Organophosphorus	out 7/03		
phorate	298-02-2	206-052-2	173	IN	Organophosphorus	out		
phosmet	732-11-6	211-987-4	318	IN	Organophosphorus	notified		
phosphamidon	13171-21-6	236-116-5	110	IN	Organophosphorus	out		
piperonyl butoxide	51-03-6	-	33	IN	Unclassified	Not a PPP		
pirimicarb	23103-98-2	245-430-1	231	IN	N-Methyl Carbamate	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
pymetrozine	123312-89-0	-	-	IN	Triazine	new ai		
pyrethrins	8003-34-7	232-319-8	32	IN	Botanical	not listed		
pyridiphenthion	119-12-0	-	8269	IN	Organophosphorus	out 7/03		
pyriproxyfen	95737-68-1	-	8271	IN	Unclassified	notified		
Quassia	nocas 450	-	8274	IN	Botanical	not listed		
s-bioallethrin	28434-00-6	-	203	IN	Pyrethroid	out 7/03		
sulfotep	3689-24-5	222-995-2	198	IN	Organophosphorus	out 7/03		
teflubenzuron	83121-18-0	-	450	IN	Benzoylurea	notified		
tefluthrin	79538-32-2	-	451	IN	Pyrethroid	notified		
terbufos	13071-79-9	235-963-8	459	IN	Organophosphorus	out 7/03		
tetramethrin	7696-12-0	-	322	IN	Pyrethroid	out 7/03		
thiacloprid	111988-49-9	-	-	IN	Chloro-nicotinyl	new ai, complete dossier sumbit-ted		
thiamethoxam	153719-23-4	-	-	IN	Unclassified	new ai, complete dossier sumbit-ted		
thiocyclam	31895-21-3	-	542	IN	Unclassified	out 7/03		
triazamate	112143-82-5	-	8336	IN	Unclassified	notified		
triazophos	24017-47-8	245-986-5	353	IN	Organophosphorus	out 7/03		
triflumuron	64628-44-0	-	548	IN	Benzoylurea	notified		
white mineral oil	8042-47-5	-	-	IN	Petroleum derivative	not listed		
bifenthrin	82657-04-3	-	415	IN, AC	Pyrethroid	notified		
fenpropathrin	39515-41-8	254-485-0	426	IN, AC	Pyrethroid	out 7/03		
carbofuran	1563-66-2	216-353-0	276	IN, NE	N-Methyl Carbamate	notified		PIC*
oxydemeton-methyl	301-12-2	206-110-7	171	IN, NE	Organophosphorus	notified		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
8-hydroxyquinoline sulfate	134-31-6	205-137-1	-	MB	Unclassified	not listed		
bronopol	52-51-7	200-143-0	8037	MB	Unclassified	out 7/03		
iron phosphate	10045-86-0	-	-	MO	Inorganic	not listed		
metaldehyde	108-62-3	203-600-2	62	MO	Aldehyde	notified		
fosthiazate	98886-44-3	-	-	NE	Organophosphorus	new ai, prov. 12.3.2002		
oxamyl	23135-22-0	245-445-3	342	NE, IN	N-Methyl Carbamate	notified		
AD 67	-	-	-	Not spec.	Unclassified	not listed		
Atplus 300 F	-	-	-	Not spec.	Unclassified	not listed		
carboxi-methyl-rutin	-	-	-	Not spec.	Unclassified	not listed		
chlormesulon	-	-	-	Not spec.	Unclassified	not listed		
dahemid	-	-	-	Not spec.	Unclassified	not listed		
fenchlorazole	103112-35-2	-	-	Not spec.	Unclassified	Not a PPP		
isopamphos	-	-	-	Not spec.	Unclassified	not listed		
mefenpyr-diethyl	135590-91-9	-	-	Not spec.	Unclassified	not listed		
MG-191	-	-	-	Not spec.	Unclassified	not listed		
n,n-diallyl-2,2-dichloroacetamide	37764-25-3	-	-	Not spec.	Unclassified	Not a PPP		
pinolen	-	-	-	Not spec.	Unclassified	not listed		
1-naphthaleneacetamide (nad)	86-86-2	-	282	PG	Botanical	not listed		
chlormequat chloride	999-81-5	213-666-4	143	PG	Quaternary Ammonium Compound	notified		
clodinafop-propargyl	105512-06-9	-	-	PG	Aryloxyphenoxy propionic acid	not listed		
daminozide	1596-84-5	216-485-9	330	PG	Unclassified	pending		

Chemical Identification						Regulatory Status		
Substance	CAS Number	EC Number	CIPAC	Use Type	Chemical Class	Directive 91/414	Water Directive	PIC
dimethipin	55290-64-7	-	8114	PG	Unclassified	notified		
ethephon	16672-87-0	240-718-3	373	PG	Organophosphorus	notified		
gibberellins	77-06-5	-	307	PG	Botanical	not listed		
heptopargil	73886-28-9	-	-	PG	Unclassified	not listed		
indole-3-acetic acid	87-51-4	-	-	PG	Botanical	not listed		
n-decyl alcohol	112-30-1	-	8093	PG	Alcohol/Ether	not listed		
NAA	86-87-3	-	313	PG	Naphthalene acetic acid derivative	not listed		
NOA	120-23-0	-	664	PG	Naphthalene acetic acid derivative	not listed		
paclobutrazol	76738-62-0	-	445	PG	Azole	notified		
chlorpropham	101-21-3	-	43	PG, HB	Other Carbamate	pending		
dichlorprop	120-36-5	204-390-5	84	PG, HB	Chlorophenoxy acid or ester	out 7/03		
chlorophacinone	3691-35-8	223-003-0	208	RD	1,3-Indandione	not listed		
paraffin wax	8002-74-2	-	8354	RD	Petroleum derivative	not listed		
potassium nitrate	7757-79-1	-	-	RD	Inorganic	not listed		
thiram	137-26-8	205-286-2	24	RE, FU	Dithiocarbamate	pending		PIC*
methiocarb	2032-65-7	217-991-2	165	RE, MO	N-Methyl Carbamate	notified		

Appendix 2 - Human Toxicology of Pesticides Authorized in Hungary

Appendix 2 presents the human toxicity of the Pesticides Authorized in Hungary according to several organisations. The classifications were taken from the from the World Health Organisation (WHO) and its Programme, from the European Union (Directive 67/548EEC), from the International Agency on Research of Cancer (IARC) and from the U.S. Environmental Protection Agency (U.S. EPA). Additional information was taken from scientific literature as noted in the footnotes of the describing chapters. To make this Appendix easier to read a list of abbreviations as well as a short repetition of the classifications will follow. Please note that the thorough description of the classification can be found in the single chapters. The source of the data can be found at the end of each classification.

List of Abbreviations - Appendix 2

CAS Number	Chemical Registry Abstract Number
WHO	World Health Organisation
EC	European Community
IARC	International Agency on Research of Cancer
U.S. EPA	U.S. Environmental Protection Agency
Prop 65	California's *The Safe Drinking Water and Toxic Enforcement Act of 1986* (Proposition 65)
ChE	Cholinesterase Inhibition
ADI	Acceptable Daily Intake in mg/kg/bw
bw	Body Weight
Muta	Mutagenicity
Reprod.	Reprod. Toxicant

Acute Toxicity - World Health Organisation (WHO)

Classification	
Ia	Extremely hazardous
Ib	Highly hazardous
II	Moderately hazardous
III	Slightly hazardous
U	Unlikely to present hazard in normal use

Source: World Health Organisation (2000-02): The WHO Recommended Classification of Pesticides by Hazard And Guidelines to Classification 2000-02

Classification of the EU

Symbol	Description
T+	Very toxic
T	Toxic
Xn	Harmful
Xi	Irritant

Several entries into the toxicity category define different toxicities for different exposure routes, the risk phrases 24-26/28 for instance means R24: Toxic in contact with skin and R26/28 Very toxic by inhalation and if swallowed.
The next list shows health related risk phrases according to Directive 67/548.

The risk phrases in the Appendix table also include environmental hazards (R50 - R56, R59) which are described in Appendix 4.

List of EC Risk Phrases to find in Appendix 2

Risk Phrase	Explanation
R 20	Harmful by inhalation.
R 20/21	Harmful by inhalation and in contact with skin.
R 20/21/22	Harmful by inhalation, in contact with skin and if swallowed.
R 20/22	Harmful by inhalation and if swallowed.
R 21	Harmful in contact with skin.
R 21/22	Harmful in contact with skin and if swallowed.
R 22	Harmful if swallowed.
R 23	Toxic by inhalation.
R 23/24	Toxic by inhalation and in contact with skin.
R 23/24/25	Toxic by inhalation, in contact with skin and if swallowed.
R 23/25	Toxic by inhalation and if swallowed.
R 24	Toxic in contact with skin.
R 24/25	Toxic in contact with skin and if swallowed.
R 25	Toxic if swallowed.
R 26	Very toxic by inhalation.
R 26/27	Very toxic by inhalation and in contact with skin.
R 26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
R 26/28	Very toxic by inhalation and if swallowed.
R 27	Very toxic in contact with skin.
R 27/28	Very toxic in contact with skin and if swallowed.
R 28	Very toxic if swallowed.
R 29	Contact with water liberates toxic gas.
R 30	Can become highly flammable in use.
R 31	Contact with acids liberates toxic gas.
R 32	Contact with acids liberates very toxic gas.

Risk Phrase	Explanation
R 33	Danger of cumulative effects.
R 34	Causes burns.
R 35	Causes severe burns.
R 36	Irritating to eyes.
R 36/37	Irritating to eyes and respiratory system.
R 36/37/38	Irritating to eyes, respiratory system and skin.
R 36/38	Irritating to eyes and skin.
R 37	Irritating to respiratory system.
R 37/38	Irritating to respiratory system and skin.
R 38	Irritating to skin.
R 39	Danger of very serious irreversible effects.
R 39/23	Toxic: danger of very serious irreversible effects through inhalation.
R 39/23/24	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R 39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R 39/23/25	Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R 39/24	Toxic: danger of very serious irreversible effects in contact with skin.
R 39/24/25	Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R 39/25	Toxic: danger of very serious irreversible effects if swallowed.
R 39/26	Very toxic: danger of very serious irreversible effects through inhalation.
R 39/26/27	Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R 39/26/27/28	Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R 39/26/28	Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R 39/27	Very toxic: danger of very serious irreversible effects in contact with skin.
R 39/27/28	Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R 39/28	Very toxic: danger of very serious irreversible effects if swallowed.
R 40	Limited evidence of a carcinogenic effect.
R 41	Risk of serious damage to eyes.
R 42	May cause sensitization by inhalation.
R 42/43	May cause sensitization by inhalation and skin contact.
R 43	May cause sensitization by skin contact.
R 44	Risk of explosion if heated under confinement.
R 45	May cause cancer.
R 46	May cause heritable genetic damage.

Risk Phrase	Explanation
R 48	Danger of serious damage to health by prolonged exposure.
R 48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R 48/20/21	Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R 48/20/21/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R 48/20/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R 48/21	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R 48/21/22	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R 48/22	Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R 48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R 48/23/24	Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R 48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R 48/23/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R 48/24	Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
R 48/24/25	Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R 48/25	Toxic: danger of serious damage to health by prolonged exposure if swallowed.
R 49	May cause cancer by inhalation.
R 60	May impair fertility.
R 61	May cause harm to the unborn child.
R 62	Possible risk of impaired fertility.
R 63	Possible risk of harm to the unborn child.
R 64	May cause harm to breast-fed babies.
R 65	Harmful: may cause lung damage if swallowed.
R 66	Repeated exposure may cause skin dryness or cracking.
R 67	Vapours may cause drowsiness and dizziness.
R 68	Possible risks of irreversible effects.
R 68/20	Harmful: possible risk of irreversible effects through inhalation.
R 68/20/21	Harmful: possible risk of irreversible effects through inhalation and in contact with skin.

Risk Phrase	Explanation
R 68/20/21/22	Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.
R 68/20/22	Harmful: possible risk of irreversible effects through inhalation and if swallowed.
R 68/21	Harmful: possible risk of irreversible effects in contact with skin.
R 68/21/22	Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
R 68/22	Harmful: possible risk of irreversible effects if swallowed.

Source: Commission Directive 2001/59/EC of 6 August 2001 adapting to technical progress for the 28th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances

Cancer Classification of the EC

Category	Description
Category 1	Substances known to be carcinogenic to humans. There is sufficient evidence to establish a causal association between human exposure to a substance and the development of cancer.
Category 2	Substances which should be regarded as if they are carcinogenic to humans. There is sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer, generally on the basis of appropriate long-term animal studies or other relevant information.
Category 3	Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.

Source: European Community (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium, plus several amendments, adaptions and modifications as noted in the footnotes of the chapters

Cancer Classification of the IARC

Group	Description
Group 1	The agent (mixture) is carcinogenic to humans.
Group 2A	The agent (mixture) is probably carcinogenic to humans.
Group 2B	The agent (mixture) is possibly carcinogenic to humans.
Group 3	The agent (mixture or exposure circumstance) is not classifiable as to its carcinogenicity to humans.
Group 4	The agent (mixture) is probably not carcinogenic to humans.

Source: International Agency for Research on Cancer (1999): Preamble to the IARC Monographs, IARS Monographs, accessible through: http://www.iarc.fr/, Lyon, France

Cancer Classification of the U.S. EPA 1986 to present

Category 1986-1996	Description
Category A	Known to cause cancer in humans. Generally based on epidemiological data showing sufficient evidence to support a causal association between exposure to the substance and cancer.
Category B	Known to cause cancer in animals but not yet definitively shown to cause cancer in humans. These chemicals are designated “probable human carcinogens.” Category B is further split into pesticides for which some evidence exists that it causes cancer in humans (B1) and those for which evidence exists only in animals (B2).
Category C	Possible human carcinogens, where the data show limited evidence of carcinogenicity in the absence of human data.
Category D	This category is for chemicals for which the data are either incomplete or ambiguous and is labelled “cannot be determined.” This category is appropriate when tumour effects or other key data are suggestive or conflicting or limited in quantity and are thus not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further chemical-specific and generic research and testing are needed to be able to describe human carcinogenic potential.
Category E	Probably not carcinogenic, with no evidence of carcinogenicity in at least two adequate animal tests in different species in adequate epidemiological and animal studies. This classification is based on available evidence and does not mean that the agent will not be a carcinogen under any circumstances.

Category 1996-1999	Description
Known/Likely	This category of descriptors is appropriate when the available tumor effects and other key data are adequate to convincingly demonstrate carcinogenic potential for humans, it includes: Agents known to be carcinogenic in humans based on either epidemiologic evidence of a combination of epidemiologic and experimental evidence, demonstrating causality between human exposure and cancer. Agents that should be treated as if they were known human carcinogens, based on a combination of epidemiologic data showing a plausible causal association (not demonstrating it definitively) and strong experimental evidence. Agents that are likely to produce cancer in humans due to the production or anticipated production of tumors by modes of action that are relevant or assumed to be relevant to human carcinogenicity.

Category 1996-1999	Description
Cannot be determined	This category of descriptors is appropriate when available tumor effects or other key data are suggestive or conflicting or limited in quantity and thus, are not adequate to convincingly demonstrate carcinogenic potential for humans. In general, further agent-specific and generic research and testing are needed to be able to describe human carcinogenic potential. The descriptor 'cannot be determined' is used with a subdescriptor that further specifies the rationale: Agents whose carcinogenic potential cannot be determined, but for which there is suggestive evidence that raises concern for carcinogenic effects. Agents whose carcinogenic potential cannot be determined because the existing evidence is composed of conflicting data (e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm any concern), agents whose carcinogenic potential cannot be determined because there are inadequate data to perform an assessment. Agents whose carcinogenic potential cannot be determined because no data arr available to perform an assessment.
Not likely	This is the appropriate descriptor when experimental evidence is satisfactory for deciding that there is no basis for human hazard concern, as follows (in the absence of human data suggesting a potential for cancer effects): Agents not likely to be carcinogenic to humans because they have been evaluated in at least two well conducted studies in two appropriate animal species without demonstrating carcinogenic effects. Agents not likely to be carcinogenic to humans because they have been appropriately evaluated in animals and show only carcinogenic effects that have been shown not to be relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha(2u)-globulin). Agents not likely to be carcinogenic to humans when carcinogenicity is dose or route dependent. For instance, not likely below a certain dose range (categorized as likely by another route of exposure). To qualify, agents will have been appropriately evaluated in animal studies and the only effects show a dose range or route limitation, or a route limitation is otherwise shown by empirical data. Agents not likely to be carcinogenic to humans based on extensive human experience that demonstrates lack of effect (e.g., phenobarbital).

Category 1999 to present	Description
Carcinogenic to humans	This descriptor is appropriate when there is convincing epidemiologic evidence demonstrating causality between human exposure and cancer. This descriptor is also appropriate when there is an absence of conclusive epidemiologic evidence to clearly establish a cause and effect relationship between human exposure and cancer, but there is compelling evidence of carcinogenicity in animals and mechanistic information in animals and humans demonstrating similar mode(s) of carcinogenic action. It is used when all of the following conditions are met: There is evidence in a human population(s) of association of exposure to the agent with cancer, but not enough to show a causal association, and There is extensive evidence of carcinogenicity, and The mode(s) of carcinogenic action and associated key events have been identified in animals, and The key events that precede the cancer response in animals have been observed in the human population(s) that also shows evidence of an association of exposure to the agent with cancer.

Category 1999 to present	Description
Likely to be carcinogenic to humans	This descriptor is appropriate when the available tumor effects and other key data are adequate to demonstrate carcinogenic potential to humans. Adequate data are within a spectrum. At one end is evidence for an association between human exposure to the agent and cancer and strong experimental evidence of carcinogenicity in animals; at the other, with no human data, the weight of experimental evidence shows animal carcinogenicity by a mode or modes of action that are relevant or assumed to be relevant to humans.
Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential	This descriptor is appropriate when the evidence from human or animal data is suggestive of carcinogenicity, which raises a concern for carcinogenic effects, but is judged not sufficient for a conclusion as to human carcinogenic potential. Examples of such evidence may include; a marginal increase in tumors that may be exposure-related, or evidence is observed only in a single study, or the only evidence is limited to certain high background tumors in one sex of one species. Dose-response assessment is not indicated for these agents. Further studies would be needed to determine human carcinogenic potential.
Data are inadequate for an assessment of human carcinogenic potential	This descriptor is used when available data are judged inadequate to perform an assessment. This includes a case when there is a lack of pertinent or useful data or when existing evidence is conflicting, e.g., some evidence is suggestive of carcinogenic effects, but other equally pertinent evidence does not confirm a concern.
Not likely to be carcinogenic to humans	This descriptor is used when the available data are considered robust for deciding that there is no basis for human hazard concern. The judgement may be based on: Extensive human experience that demonstrates lack of carcinogenic effect (e.g., phenobarbital). Animal evidence that demonstrates lack of carcinogenic effect in at least two well designed and well conducted studies in two appropriate animal species (in the absence of human data suggesting a potential for cancer effects). Extensive experimental evidence showing that the only carcinogenic effects observed in animals are not considered relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha-2u-globulin).Evidence that carcinogenic effects are not likely by a particular route of exposure. Evidence that carcinogenic effects are not anticipated below a defined dose range.

Source: US Environmental Protection Agency Office of Pesticide Programmes (2000): List of Chemicals Evaluated for Carcinogenic Potential, U.S. EPA Office of Pesticide Programmes, Washington, DC, USA

Mutagenicity Classification of the EU

Category	Description
Category 1	Substances known to be mutagenic to humans. There is sufficient evidence to establish a causal association between human exposure to a substance and heritable genetic damage.
Category 2	Substances which should be regarded as if they are mutagenic to humans. There is sufficient evidence to provide a strong presumption that human exposure to the substance may result in the development of heritable genetic damage, generally on the basis of appropriate animal studies, or other relevant information.
Category 3	Substances which cause concern for humans owing to possible mutagenic effects. There is evidence from appropriate mutagenicity studies, but this is insufficient to place the substance in Category 2.

Source: European Community (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium, plus several amendments, adaptions and modifications as noted in the footnotes of the chapters.

EU Classification of Substances Toxic to Reproduction

Category	Description
Category 1	1. Substances known to impair fertility in humans. 2. Substances known to cause developmental toxicity in humans.
Category 2	1. Substances known to impair fertility in humans. 2. Substances known to cause developmental toxicity in humans.
Category 3	1. Substances which cause concern for human fertility. 2. Substances which cause concern for humans owing to possible developmental toxic effects.

Source: European Community (1967): Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal 196, Brussels, Belgium, plus several amendments, adaptions and modifications as noted in the footnotes of the chapters

Cholinesterase Inhibition

Sources: 1. U.S. EPA, Office of Pesticide Programmes (2000): Science Policy on The Use of Data on Cholinesterase Inhibition for Risk Assessments of Organophosphorous and Carbamate Pesticides, Office of Pesticide Programme, US Environmental Protection Agency, Washington, USA

2. U.S. EPA, Office of Pesticide Programmes (2000): Science Policy on The Use of Data on Cholinesterase Inhibition for Risk Assessments of Organophosphorous and Carbamate Pesticides, p. 16. Office of Pesticide Programme, US Environmental Protection Agency, Washington, USA

Acceptable Daily Intake (WHO)

The values in Appendix 4 should be interpreted as follows: the smaller the value i.e. the amount a human can consume on a daily basis, the greater is the chronic toxicity of the pesticide. *Fipronil*, *oxydemeton-methyl* and c*hlorfenvinphos* are therefore the pesticides with the highest chronic toxicity in the list of evaluated pesticides.

Source: World Health Organisation/ International Programme on Chemical Safety (1999): Inventory of IPCS and Other WHO Pesticide Evaluation and Summary of Toxicological Evaluations Performed by the Joint Meeting On Pesticide Residues (JMPR) through 1999, WHO/ IPCS, Vienna, Switzerland

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	ADI mg/kg/bw
iron phosphate	10045-86-0	MO										
metaldehyde	108-62-3	MO	II	Xn	10-22							
dinocap	39300-45-3	AC, FU	III	Xn	22-38			E				0,008
hexythiazox	78587-05-0	AC, IGR	U		50/53			C				0,03
amitraz	33089-61-1	AC, IN	III	Xn	22			C				0,01
bromopropylate	18181-80-1	AC, IN	U									0,03
clofentezine	74115-24-5	AC, IN	U					C				0,02
cyhexatin	13121-70-5	AC, IN	III	Xn	20/21/22-50/53			Not likely to be carcinogenic to humans				0,007
dichlorvos (DDVP)	62-73-7	AC, IN	Ib	T+	24/25-26-43-50		2B	C			Yes	0,004
Endosulfan	115-29-7	AC, IN	II	T	24/25-36-50/53			E				0,006
Fenazaquin	120928-09-8	AC, IN	II	T	20-25-50/53							
fenbutatin-oxide	13356-08-6	AC, IN	U	T+	26-36/38-50/53			E				0,03
flufenoxuron	101463-69-8	AC, IN	U									
lambda cyhalothrin	91465-08-6	AC, IN		T+	21-25-26-50/53							
malathion	121-75-5	AC, IN	III	Xn	22		3	D			Yes	0,3
propargite	2312-35-8	AC, IN	III	Xn	22-36-50/53			B2				0,01

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
tebufenpyrad	119168-77-3	AC, IN	III									
tetradifon	116-29-0	AC, IN	U									
aldicarb	116-06-3	AC, IN, NE	Ia	T+	24-26/28-50/53		3	E			Yes	0,003
phosalone	2310-17-0	AC,IN	II	T	21-25-50/53						Yes	0,02
pirimiphos-methyl	29232-93-7	AC,IN	III	Xn	22			Can not be determined			Yes	0,03
pyridaben	96489-71-3	AC,IN	III	T	23/25-50/53			E				
permethrin	52645-53-1	AD,IN, AC	II	Xn	22		3	C				0,05
copper hydroxide	20427-59-2	BA, FU	III									
copper oxychloride	1332-40-7	BA, FU	III									
boric acid	10043-35-3	BA, FU, IN										
bronopol	52-51-7	BI	II		Xn; N R: 21/22-37/38-41-50 S: (2-)26-37/39-61			E				
1,1'-(iminobis(octamethylene)diguanidine	13516-27-3	FU	II									0,03
azoxystrobin	131860-33-8	FU	U	T	23-50/53			Not Likely				
benalaxyl	71626-11-4	FU	U									0,05
benomyl	17804-35-2	FU	U	Xn	68			C	3			0,1

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification						ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
bitertanol	55179-31-2	FU	U									0,01
bromuconazole	116255-48-2	FU	II					E				
bupirimate	41483-43-6	FU	U									
captan	133-06-2	FU	U	T	23-40-41-43-50	3	3	B2				0,1
carbendazim	10605-21-7	FU	U	Xn	68			C	3			0,03
carboxin	5234-68-4	FU	U									
chlorothalonil	1897-45-6	FU	U	Xn	40-50/53	3	2B	Likely				0,03
copper 8-quinoli-noleate	10380-28-6	FU	U				3					
copper sulfate (anhy-drous)	7758-98-7	FU	II	Xn	22-36/38-50/53							
cymoxanil	57966-95-7	FU	III	Xn	22-43-50/53			Not Likely				
cyproconazole	94361-06-5	FU	III	Xn	22-50/53-63			B2		3		
cyprodinil	121552-61-2	FU										
dichlofluanid	1085-98-9	FU	U	Xn	20-36-43-50/53							0,3
diclobutrazol	75736-33-3	FU		Xi	36-51/53							
difenoconazole	119446-68-3	FU	III					C				
dimethomorph	110488-70-5	FU	U		51/53							
diniconazole	83657-18-5	FU										
dinitro cresol	534-52-1	FU	Ib	T+	26/27/28-38-68-41-43-44-50/53				3			

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
diphenylamine	122-39-4	FU		T	23/24/25-33-50/53							0,08
dithianon	3347-22-6	FU	III	Xn	22-50/53							0,01
dodine	2439-10-3	FU	III	Xn	22-36/38-50/53							
epoxiconazole	106325-08-0	FU		T	61-40-62-51/53	3				2; 3		
ethoxyquin	91-53-2	FU		Xn	22							0,005
famoxadone	131807-57-3	FU	U									
fenarimol	60168-88-9	FU	U	Xn	51/53-62-63-64			E		3		0,01
fenhexamid	126833-17-8	FU	U									
fenitropan	65934-94-3	FU										
fenpiclonil	74738-17-3	FU	U									
fenpropimorph	67564-91-4	FU	U	Xn	20-38-51/53							
fentin hydroxide	76-87-9	FU	II	T+	24/25-26-37/38-40-41-48/23-50/53-63	3		B2		3		0,0005
fluazinam	79622-59-6	FU										
fludioxonil	131341-86-1	FU										
fluquinconazole	136426-54-5	FU		T	21-23/25-38-48/25-50/53							
flusilazole	85509-19-9	FU	III	T	61-22-40-51/53	3		Deferred		2		0,001
flutriafol	76674-21-0	FU	III									
folpet	133-07-3	FU	U	Xn	20-36-40-43-50	3		B2				0,1

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	ADI mg/kg/bw
fosetyl-al	39148-24-8	FU						Not amenable to classification				
fuberidazole	3878-19-1	FU	II	Xn	22-50/53							
guazatine	108173-90-6	FU	II	Xn	21/22-36/38-50/53							
hexaconazole	79983-71-4	FU	U	Xi	43-51/53			C				0,005
hymexazol	10004-44-1	FU	U	Xn	22-41-52/53							
imazalil	35554-44-0	FU	II	Xn	20/22-41-50/53			C				0,03
iminoctadine	39202-40-9	FU										
iprodione	36734-19-7	FU	U	Xn	40-50/53	3		Likely				0,06
iprovalicarb	140923-17-7	FU	U									
kasugamycin	6980-18-3	FU										
kresoxim-methyl	143390-89-0	FU		Xn	40-50/53	3		Likely to be carcinogenic to humans				
mancozeb	8018-01-7	FU	U	Xi	37-43			B2				0,03
metalaxyl	57837-19-1	FU	III					E				0,03
metconazole	125116-23-6	FU	III									
metiram	9006-42-2	FU	U									0,03
myclobutanil	88671-89-0	FU	III	Xn	22-36-51/53-63			E		3		0,03

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
nuarimol	63284-71-9	FU	III									
oxycarboxin	5259-88-1	FU	U	Xn	22-52/53							
penconazole	66246-88-6	FU	U									0,03
pencycuron	66063-05-6	FU	U									
polyoxin b	19396-06-6	FU										
prochloraz	67747-09-5	FU	III	Xn	22-50/53			C				0,01
procymidone	32809-16-8	FU	U					B2				0,1
propamocarb hydro-chloride	25606-41-1	FU						D				
propiconazole	60207-90-1	FU	II					C				0,04
propineb	12071-83-9	FU	U									0,007
pyrimethanil	53112-28-0	FU	U					C				
quinoxyfen	124495-18-7	FU	U	Xi	43-50/53							
spiroxamine	118134-30-8	FU	II	Xn	20/21/22-38-43-50/53							
sulfur	7704-34-9	FU	U									
tebuconazole	107534-96-3	FU	III					C				0,03
tetraconazole	112281-77-3	FU	II	Xn	20/22-40-51/53	3		Likely to be carci-nogenic to humans				

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
thiabendazole	148-79-8	FU	U		50/53			Likely to be carci-nogenic to humans				0,1
thiophanate-methyl	23564-05-8	FU	U	Xn	20-43-50/53-68			Likely to be carci-nogenic to humans	3			0,02
tolylfluanid	731-27-1	FU	U	T	23-36/37/38-43-48/ 20-50/53							0,1
triadimefon	43121-43-3	FU	III	Xn	22-51/53			C				0,03
triadimenol	55219-65-3	FU	III					C				0,05
tridemorph	24602-86-6	FU	II	T	61-20/22-38-50/53					2		
trifloxystrobin	141517-21-7	FU										
triflumizole	68694-11-1	FU						E				
triforine	26644-46-2	FU	U									
triphenyltin acetate	900-95-8	FU	II	T+	24/25-26-37/38-40-41-48/23-50/53-63	3				3		0,0005
triticonazole	131983-72-7	FU	U									
vinclozolin	50471-44-8	FU	U	T	60-61-40-43-51/53	3		C		2		0,01
zineb	12122-67-7	FU	U	Xi	37-43		3					0,03

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
ziram	137-30-4	FU	III	Xn	22-36/37/38-68		3	Likely to be carci-nogenic to humans	3			0,02
dazomet	533-74-4	FU, IN, NE, HB,	III	Xn	22-36-50/53			D				
aluminum phosphide	20859-73-8	FUM		T+	15/29-28-32							
magnesium phos-phide	12057-74-8	FUM		T+	15/29-28-50							
metam sodium, dihy-drate	137-42-8	FUM	II		22-31-34-43-50/53			B2				
2,4-D	94-75-7	HB	II	Xn	22-37-41-43-52/53		2B	D				0,3
acetochlor	34256-82-1	HB	III	Xn	20-37/38-43-50/53			B2				
acifluorfen, sodium salt	62476-59-9	HB						B2				
alachlor	15972-60-8	HB	III	Xn	22-40-43-50/53	3		Likely (high doses) Not likely (low doses)				
amidosulfuron	120923-37-7	HB										
asulam	3337-71-1	HB	U					C				

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
atrazine	1912-24-9	HB	U	Xn	43-48/22-50/53		3	C				0,0007
azafenidin	68049-83-2	HB						Data are inade-quate for an assess-ment of human carcino-genic potential				
benfluralin	1861-40-1	HB	U									
bensulfuron methyl	83055-99-6	HB	U	Xi	43-51/53							
bentazone	25057-89-0	HB	III	Xn	65-36-43-52/53			E				0,1
benzoylprop ethyl	22212-55-1	HB		Xn	22-50/53							
bifenox	42576-02-3	HB	U									
bromoxynil phenol	1689-84-5	HB	II	T	25-63			C		3		
butylate	2008-41-5	HB	U					E				
carfentrazone-ethyl	128639-02-1	HB			50/53							
chlorbromuron	13360-45-7	HB	U									
chlorotoluron	15545-48-9	HB	U									0,015
chloroxuron	1982-47-4	HB										
chlorsulfuron	64902-72-3	HB	U		50/53							

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
cinidon-ethyl	142891-20-1	HB										
clethodim	99129-21-2	HB										0,01
clomazone	81777-89-1	HB	II									
clopyralid	1702-17-6	HB		Xi	41-51/53							
cyanazine	21725-46-2	HB	II	Xn	22-50/53			C				
cycloate	1134-23-2	HB	III									
cycloxydim	101205-02-1	HB	U									0,07
desmedipham	13684-56-5	HB	U					E				
dicamba	1918-00-9	HB	III	Xn	22-41-52/53			D				
dichlobenil	1194-65-6	HB	U	Xn	21-51/53			C				
diclofop-methyl	51338-27-3	HB		Xn	22-43-50/53			C				
difenzoquat	49866-87-7	HB										
dimethachlor	50563-36-5	HB	III	Xn	22-43-50/53							
dimethenamid	87674-68-8	HB						C				
diphenamid	957-51-7	HB	III	Xn	22-52/53							
diquat dibromide	85-00-7	HB		T+	22-26-36/37/38-43-48/25-50/53			E				
diuron	330-54-1	HB	U	Xn	22-40-48/22-50/53	3		Known/ Likely				
EPTC	759-94-4	HB	II	Xn	22							
ethalfluralin	55283-68-6	HB	U					C				

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	ADI mg/kg/bw
ethofumesate	26225-79-6	HB	U		51/53			D				
fenoxaprop-p (+)	71283-80-2	HB										
fenoxaprop-p (+/-)	66441-23-4	HB		Xi	43-50/53							
fenuron	101-42-8	HB	U									
ferrous sulfate hep-tahydrate	7782-63-0	HB										
flamprop-isopropyl	52756-22-6	HB										
flazasulfuron	104040-78-0	HB			50/53							
florasulam	145701-23-1	HB										
fluazifop-butyl	69806-50-4	HB		T	61-50/53							
fluazifop-p-butyl	79241-46-6	HB		Xn	50/53-63					3		
flufenacet	142459-58-3	HB	III	Xn	22-43-48/22-50/53			Not Likely				
flumioxazin	103361-09-7	HB		T	61-50/53				2			
fluorochloridone	61213-25-0	HB	U									
fluoroglycofen	77501-60-1	HB	III									
flupyrsulfuron-methyl, sodium salt	144740-54-5	HB	U		50/53							
flurenol	467-69-6	HB	U		51/53							
fluroxypyr	69377-81-7	HB	U		52/53			Not Likely				
fluroxypyr 1-methyl-heptyl ester	81406-37-3	HB			50/53							

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
fomesafen	72178-02-0	HB	III	Xn	22			C				
fosamine, ammonium salt	25954-13-6	HB	U									
glufosinate-ammonium	77182-82-2	HB		Xn	22							
glyphosate	1071-83-6	HB	U	Xi	41-51/53			E				0,3
glyphosate-trimesium	81591-81-3	HB		Xn	22-51/53			E				
haloxyfop (unstated stereochemistry)	69806-34-4	HB	II									0,0003
haloxyfop-r	72619-32-0	HB		Xn	22-50/53							
hexazinone	51235-04-2	HB	III	Xn	22-36-50/53			D				
imazamethabenz	81405-85-8	HB	U					D				
imazamox	114311-32-9	HB						Not Likely				
imazapyr	81334-34-1	HB	U	Xi	36-52/53			E				
imazaquin	81335-37-7	HB	U									
imazethapyr	81335-77-5	HB	U									
iodosulfuron methyl, sodium salt	144550-36-7	HB										
ioxynil	1689-83-4	HB	II	T	21-25-50/53-63					3		
isopropalin	33820-53-0	HB										
isoproturon	34123-59-6	HB	III	Xn	22-40-50/53	3						

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
isoxaben	82558-50-7	HB	U					C				
isoxaflutole	141112-29-0	HB		Xn	50/53-63				3			
lenacil	2164-08-1	HB	II									
linuron	330-55-2	HB	U	Xn	22-40-48/22-50/53	3		C				
MCPA	94-74-6	HB	III	Xn	22-38-41		2B					
MCPB	94-81-5	HB	III	Xn	22		2B					
MCPP	7085-19-0	HB	III	Xn	22-38-41		2B					
mecoprop-p	16484-77-8	HB	III				2B					
metamitron	41394-05-2	HB	III	Xn	22-50/53							
metazachlor	67129-08-2	HB	U									
metobromuron	3060-89-7	HB	U									
metolachlor	51218-45-2	HB	III					C				0,0015
metolachlor, (S)	87392-12-9	HB										
metoxuron	19937-59-8	HB	U		50/53							
metribuzin	21087-64-9	HB	II	Xn	22-50/53			D				
molinate	2212-67-1	HB	II	Xn	22			C				0,002
napropamide	15299-99-7	HB	U									
naptalam	132-66-1	HB	U					D				
nicosulfuron	111991-09-4	HB	U					E				
oxyfluorfen	42874-03-3	HB	U					C				

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
pendimethalin	40487-42-1	HB	III	Xi	43-50/53			C				0,005
phenmedipham	13684-63-4	HB	U					D				
primisulfuron	113036-87-6?	HB	U									
prometryn	7287-19-6	HB	U					E				
propachlor	1918-16-7	HB	III	Xn	22-36-43-50/53			Likely				
propanil	709-98-8	HB	III	Xn	22-50							0,05
propaquizafop	111479-05-1	HB	U									
propisochlor	86763-47-5?	HB										
propyzamide	23950-58-5	HB	U	Xn	40-50/53	3		B2				
prosulfuron	94125-34-5	HB		Xn	22-50/53			D				
pyraflufen	129630-17-7	HB										
pyrazon	1698-60-8	HB	U	Xi	43-50/53							
pyridate	55512-33-9	HB	III	Xi	38-43-50/53							
quinclorac	84087-01-4	HB	U	Xi	43			D				
quinmerac	90717-03-6	HB	U									
quizalofop-ethyl	76578-14-8	HB						D				
quizalofop-p	94051-08-8	HB										
quizalofop-p-tefuryl	119738-06-6	HB	II	T	61-22-48/22-62-68-50/53				3	2;3		
rimsulfuron	122931-48-0	HB	U					E				

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	ADI mg/kg/bw
sethoxydim	74051-80-2	HB	III									
sulfosulfuron	141776-32-1	HB						Likely				
terbacil	5902-51-2	HB	U					E				
terbuthylazine	5915-41-3	HB	U					D				
terbutryn	886-50-0	HB	U					C				
thifensulfuron-methyl	79277-27-3	HB	U									
thiobencarb	28249-77-6	HB	II	Xn	22-50/53			D				
tralkoxydim	87820-88-0	HB	III					Likely				
triasulfuron	82097-50-5	HB	U		50/53			E				
tribenuron methyl	101200-48-0	HB		Xi	43			C				
triclopyr	55335-06-3	HB	III					D				
trifluralin	1582-09-8	HB	U	Xi	36-43-50/53		3	C				0,048
triflusulfuron-methyl	126535-15-7	HB	U					C				
vernolate	1929-77-7	HB	II	Xn	22-51/53							
methyl bromide	74-83-9	HB,AC, IN,NE, FU,RO		T	23/25-36/37/38-40-48/20-50-59		3	D				1
acephate	30560-19-1	IN	III	Xn	22			C			Yes	0,03
acetamiprid	135410-20-7	IN										
avermectin	71751-41-2	IN										0,002
azinphos-methyl	86-50-0	IN	Ib	T+	24-26/28-43-50/53			E			Yes	0,005

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
barium polysulfide	50864-67-0	IN		Xi	31-36/37/38							
bendiocarb	22781-23-3	IN	II	T	21-23/25-50/53			Not Likely			Yes	0,004
benfuracarb	82560-54-1	IN	II	T	23/25-50/53							
bensultap	17606-31-4	IN	III	Xn	22-50/53							
beta-cyfluthrin	65731-84-2	IN	II	T+	26/28-50/53							
buprofezin	69327-76-0	IN	U					Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential				0,01
butocarboxim	34681-10-2	IN	Ib	T	10-23/24/25-36-50/53						Yes	
carbaryl	63-25-2	IN	II	Xn	22-40-50	3	3	C			Yes	0,008
carbosulfan	55285-14-8	IN	II	T	23/25-43-50/53						Yes	0,01
cartap monohydrochloride	15263-52-2	IN		Xn	21/22-50/53							
chlorfluazuron	71422-67-8	IN	U									
chlorpyrifos	2921-88-2	IN	II	T	24/25-50/53			E			Yes	0,01

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
chlorpyrifos-methyl	5598-13-0	IN	U								Yes	0,01
cyfluthrin	68359-37-5	IN	II	T+	23-28-50/53							0,02
cypermethrin (stereochemistry unspecified)	52315-07-8	IN	Ib					C				0,05
cypermethrin, alpha	67375-30-8	IN	II									
cypermethrin, beta	65731-84-2	IN										
deltamethrin	52918-63-5	IN	II	T	23/25-50/53		3					0,01
diazinon	333-41-5	IN	II	Xn	22-50/53			Not Likely			Yes	0,002
diflubenzuron	35367-38-5	IN	U					E				0,02
dimethoate	60-51-5	IN	II	Xn	21/22			C			Yes	0,002
dioxacarb	6988-21-2	IN		T	25-51/53						Yes	
esfenvalerate	66230-04-4	IN	II	T	23/25-43-50/53			E				
ethofenprox	80844-07-1	IN	U					C				0,03
etrimfos	38260-54-7	IN	II	Xn	22						Yes	0,003
fenitrothion	122-14-5	IN	II	Xn	22-50/53			E			Yes	0,005
fenoxycarb	72490-01-8	IN	U		50/53			B2				
fenpryroximate	134098-61-6?	IN						Not Likely				0,01
fenthion	55-38-9	IN	II	T	21/22-23-68-48/25-50/53			E	3		Yes	0,007
fipronil	120068-37-3	IN	II					C				0,0002

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
flucycloxuron	113036-88-7	IN	U									
flufenzine	162320-67-4	IN										
heptenophos	23560-59-0	IN	Ib	T	25						Yes	
hexaflumuron	86479-06-3	IN	U									
imidacloprid	138261-41-3	IN	II									
indoxycarb	173584-44-6	IN						Not likely to be carcinogenic to humans				
lufenuron	103055-07-8	IN		Xi	43-50/53							
methamidophos	10265-92-6	IN	Ib	T+	24-28-36-50			E			Yes	0,004
methidathion	950-37-8	IN	Ib	T+	21-28-50/53			C			Yes	0,001
methomyl	16752-77-5	IN	Ib	T+	28-50/53			Not Likely			Yes	0,02
methyl parathion	298-00-0	IN	Ia	T+	24-28		3	Not Likely			Yes	0,003
mineral oil	8012-95-1	IN					3					
oxythioquinox	2439-01-2	IN	III	Xn	20/21/22-36-43-48/ 22-50/53-62			B2				0,006
phenthoate	2597-03-7	IN	II	Xn	21/22						Yes	
phorate	298-02-2	IN	Ia	T+	27/28			E			Yes	0,0005
phosmet	732-11-6	IN	II	Xn	21/22			C			Yes	0,01
phosphamidon	13171-21-6	IN	Ia	T+	24-28-40-50/53			C			Yes	0,0005

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						ADI mg/kg/bw
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	
piperonyl butoxide	51-03-6	IN	U				3	C				0,02
pirimicarb	23103-98-2	IN	II	T	25-50/53						Yes	0,02
pymetrozine	123312-89-0	IN						Likely to be carci-nogenic to humans				
pyrethrins	8003-34-7	IN	II	Xn	20/21/22-50/53			Likely				0,04
pyrethrins	8003-34-7	IN	II	Xn	20/21/22-50/53			Likely				0,04
pyridiphenthion	119-12-0	IN	III								Yes	
pyriproxyfen	95737-68-1	IN	U					E				
s-bioallethrin	28434-00-6	IN										
sulfotep	3689-24-5	IN	Ia	T+	27/28						Yes	
teflubenzuron	83121-18-0	IN	U									0,01
tefluthrin	79538-32-2	IN	Ib									
terbufos	13071-79-9	IN	Ia	T+	27/28			E			Yes	0,0002
tetramethrin	7696-12-0	IN	U					C				
thiacloprid	111988-49-9?	IN	II									
thiamethoxam	153719-23-4	IN						Likely to be carci-nogenic to humans				
thiocyclam	31895-21-3	IN										

Chemical	CAS Number	Use Type	WHO	EU Classification		Cancer Classification			EU Muta	EU Repro	ChE	ADI mg/kg/bw
				Symbol	Risk Phrase	EU	IARC	U.S EPA				
triazamate	112143-82-5	IN	II									
triazophos	24017-47-8	IN	Ib	T	21-23/25-50/53						Yes	0,001
triflumuron	64628-44-0	IN	U									
white mineral oil	8042-47-5	IN					3					
bifenthrin	82657-04-3	IN, AC	II					C				0,02
fenpropathrin	39515-41-8	IN, AC		T+	21-25-26-50/53			E				0,03
carbofuran	1563-66-2	IN, NE	Ib	T+	26/28-50/53			Not Likely			Yes	0,01
oxydemeton-methyl	301-12-2	IN, NE	Ib	T	24/25-50			Not Likely			Yes	0,0003
8-hydroxyquinoline sulfate	134-31-6	MB		Xn	22							
fosthiazate	98886-44-3	NE		T	21-23/25-39-41-43-50/53						Yes	
oxamyl	23135-22-0	NE, IN	Ib	T+	21-26/28-51/53			Not Likely			Yes	0,03
quinine hydrochloride(dihydrate)	6119-47-7	OT										
acibenzolar-s-methyl	135158-54-2	PG		Xi	36/37/38-43-50/53			Not likely to be carcinogenic to humans				
chlorpropham	101-21-3	PG, HB	U				3	E				0,03
chlorophacinone	3691-35-8	RD	Ia	T+	23-27/28-48/24/25-50/53							

Chemical	CAS Number	Use Type	EU Classification			Cancer Classification						
			WHO	Symbol	Risk Phrase	EU	IARC	U.S EPA	EU Muta	EU Repro	ChE	ADI mg/kg/bw
thiram	137-26-8	RE, FU	III	Xn	20/22-36/37-68-43		3		3			0,01
methiocarb	2032-65-7	RE, MO	Ib	T	25-50/53			D			Yes	0,02
potassium nitrate	7757-79-1	RO										

Appendix 3 - Ingredients Authorized in Hungary and their Listing as Endocrine Disruptors

EU Endocrine Disruption Categories

Category	Description
Category 1	At least one study providing evidence of endocrine disruption in an intact organism. Not a formal weight of evidence approach.
Category 2	Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations.
Category 3	No scientific basis for inclusion in list. Additionally category 3 distinguishes 3 subcategories: A(w,m) - no data available on wildlife relevant and/or mammal relevant endocrine effects; B - some data are available but the evidence is insufficient for identification. C - data available indicating no scientific basis for inclusion in list

EU Persistence Categories

Highly persistent substances were selected on basis of Quantitative Structural Analysis Relationships (QSAR) derived from the Syracuse Estimation program. Combining two biodegradation models (the linear probability model and the ultimate degradation model), substances are considered as highly persistent that have a low probability of degradation (P<0.1) when applying the linear probability model and ultimately biodegrade in more than months when applying the ultimate degradation model. For the list only the highly persistent substances were selected with an ultimate degradation of more than months. This group was supplemented with a number of PCBs, polychlorinated -dioxins and -dibenzofurans, polybrominated -biphenyls and -biphenylethers, which were considered as very persistent by the expert group

Other substances added to the list were metals from the EDS working list.

In the list four categories are distinguished on persistence:

Category	Criteria
Highly persistent substances (Pers+)	SRC calculations fulfilling the most stringent criteria
Persistent substances (Pers)	SRC calculations fulfilling less stringent criteria
Not persistent (Not pers)	SRC calculations not fulfilling criteria for persistence.
MetalSubstance is a metal	SRC calculations not used
No data	Biodegradation not calculated

EU Exposure Definition

In the list ED Category 1 substances are identified with high, medium or low exposure concern, applying the following criteria:

Category	Criteria
High concern	Human exposure is expected, due to environmental concentrations and those in food or consumer products, also taking into consideration exposure of vulnerable groups *and*/*or* wildlife exposure is expected, due to use and emission patterns, and the chemical is persistent and bioaccumulative
Medium concern	Human exposure is not expected *and* wildlife exposure is expected, due to use and emission patterns, but the chemical is readily biodegradable and not bioaccumulative
Low concern	No human exposure *and* no wildlife exposure

						European Union			
Chemical	**Use Type**	**Colborn**	**Benbrook**	**EPA Illinois**	**Keith**	**EU Review.**	**EU ED Cat.**	**Persist.**	**Exposure Concern**
clofentezine	AC	Thyroid				x		Not pers	
amitraz	AC, IN					x		Not pers	
DDVP (Dichlorvos)	AC, IN					x		Not pers	
endosulfan	AC, IN	Estrogen	Y	Y	K	x	2	Pers+	
lambda cyhalothrin	AC, IN	Thyroid				x		Not pers	
malathion	AC, IN	Thyroid	Y		S	x	2	Not pers	
aldicarb	AC, IN, NE		Y	Y	S	x		Not pers	
permethrin	AD,IN,AC	Estrogenic		Y	S	x		Not pers	
copper oxychloride	BA, FU					x	3 C	metal	
benomyl	FU		Y	Y	P	x		Not pers	
carbendazim	FU					x	2	Not pers	
copper sulfate (anhydrous)	FU					x	3 C	metal	
difenoconazole	FU					x		Pers	
fenarimol	FU	Estrogen				x		Pers	
fentin hydroxide	FU			Y					
flutriafol	FU					x		Pers	
iprodione	FU	Inhibition of testosterone synthesis				x	2	Not pers	
mancozeb	FU	Thyroid	Y	Y	P				
metiram	FU		Y		P	x		Not pers	
myclobutanil	FU					x		Not pers	
penconazole	FU					x		Not pers	

						European Union			
Chemical	**Use Type**	**Colborn**	**Benbrook**	**EPA Illinois**	**Keith**	**EU Review.**	**EU ED Cat.**	**Persist.**	**Exposure Concern**
prochloraz	FU					x	2	Not pers	
procymidone	FU	Androgen				x		Pers	
propiconazole	FU					x		Pers	
pyrimethanil	FU	Thyroid							
tebuconazole	FU					x		Not pers	
triadimefon	FU	Estrogen				x	2	Not pers	
triadimenol	FU	Estrogen							
triphenyltin acetate	FU					x	1	metal	High
vinclozolin	FU	Androgen	Y	Y	P	x	1	Pers	High
zineb	FU	Thyroid	Y		P	x	1	Not pers	High
ziram	FU	Thyroid	Y	Y	S	x	2	Not pers	
metam sodium, dihydrate	FUM					x	1	Not pers	High
2,4-d	HB		Y	Y	P	x	2	Not pers	
acetochlor	HB	Thyroid (decrease of thyroid hormone levels, increase in TSH)				x	1	Not pers	High
alachlor	HB	Thyroid (decrease of thyroid hormone levels, increase in TSH)	Y	Y	P	x	1	Not pers	High
atrazine	HB	Neuroendocrine-pituitary (depression of LH surge), testosterone metabolism.	Y	Y	K	x	1	Pers	High
bromoxynil phenol	HB					x		Not pers	
cyanazine	HB			Y		x		Not pers	
diuron	HB					x	2	Not pers	
linuron	HB	Androgen				x	1	Not pers	High
metolachlor	HB		Y						
metolachlor, (s)	HB		Y						
metribuzin	HB	Thyroid	Y	Y	S	x		Not pers	
pendimethalin	HB	Thyroid				x		Pers	
prometryn	HB					x		Not pers	
propyzamide	HB					x		Not pers	

						European Union			
Chemical	**Use Type**	**Colborn**	**Benbrook**	**EPA Illinois**	**Keith**	**EU Review.**	**EU ED Cat.**	**Persist.**	**Exposure Concern**
terbutryn	HB					x		Pers	
trifluralin	HB	Reproductive/ Metabolic	Y	Y	P	x		Pers	
methyl bromide	HB,AC,IN,NE,FU,RO					x	2	Not pers	
fluazifop-butyl	HE					x		Not pers	
ioxynil	HE					x		Not pers	
molinate	HE					x		Not pers	
propanil	HE					x	2	Not pers	
quizalofop-ethyl	HE					x		Not pers	
acephate	IN					x		Not pers	
avermectin	IN					x		No data	
carbaryl	IN	Estrogen and progesterone	Y	Y	S	x		Not pers	
chlorpyrifos	IN		Y	Y		x		Not pers	
zeta-cypermethrin (stereochemistry unspecified)	IN	Disruption of reproductive function	Y	Y	S	x		Not pers	
deltamethrin	IN					x		Not pers	
diazinon	IN					x	2	Not pers	
diflubenzuron	IN					x		Pers	
dimethoate	IN					x	2	Not pers	
esfenvalerate	IN				S	x		Not pers	
ethofenprox	IN					x		Not pers	
fenitrothion	IN	Antiandrogen				x		Not pers	
fenoxycarb	IN					x		Not pers	
fenthion	IN					x	3 C*	Not pers	
fipronil	IN	Thyroid							
methomyl	IN	Thyroid	Y	Y	S	x		Not pers	
methyl parathion	IN			Y	P	x	2	Not pers	
phosphamidon	IN					x		Not pers	
piperonyl butoxide	IN					x		Not pers	
bifenthrin	IN, AC					x		Pers	
carbofuran	IN, NE					x		Not pers	
oxydemeton-methyl	IN, NE					x		Not pers	

							European Union		
Chemical	**Use Type**	**Colborn**	**Benbrook**	**EPA Illinois**	**Keith**	**EU Review.**	**EU ED Cat.**	**Persist.**	**Exposure Concern**
thiram	RE, FU	Neuroendo-crine-pitu-itary (depression of LH surge), thyroid (decrease of T4, increase of TSH)				x	1	Not pers	High

Y = Yes; S = Suspected, K = Known, P = Probable

* In a number of cases the substance was identified on the basis of additional information from industry

Sources:

European Commission (2000): Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting, Delft

Illinois Environmental Protection Agency, (1997): Report on Endocrine Disrupting Chemicals, Illinois EPA, USA

L. H. Keith, (1997):Environmental Endocrine Disruptors: A Handbook of Property Data, Wiley Interscience, New York, USA

T. Colborn, D. Dumanoski, and J. P. Myers, (1996): Our Stolen Future, Penguin Books, New York, USA, accessible through http://www.osf-facts.org/

C. M. Benbrook, (1996): Growing Doubt: A Primer on Pesticides Identified as Endocrine Disruptors and/or Reproductive Toxicants, National Campaign for Pesticide Policy Reform

Further Readings

McLachlan, J.A., Arnold, S.F., (1996): Environmental Estrogens, American Scientist, accessible through http://www.amsci.org/amsci/articles/96articles/McLachla.html

Commission on Life Sciences, (2000): Hormonally Active Agents in the Environment, The National Academy of Science, Washington DC, USA, accessible through http://www.nap.edu/books/0309064198/html/

National Institute of Environmental Health Sciences (1997): Environmental Health Perspectives, Hormones and Health, USA, accessible http://ehpnet1.niehs.nih.gov/qa/105-5focus/focus.html

U.S. Environmental Protection Agency - Region 5 (1997): Proceedings Of The 1997 Great Lakes Endocrine Disrupters Symposium, U.S. EPA, Chicago, USA

Web links

The Global Endocrine Disruptor Research Inventory: http://endocrine.ei.jrc.it/gedri/pack_edri.All_Page

U.S. EPA, Office of Science Coordination and Policy: http://www.epa.gov/scipoly/oscpendo/resource.htm

Center for Bioenvironmental Research Tulane/Xavier Universities (CBR): http://www.som.tulane.edu/ecme/eehome/

Greater Boston Physicians for Social Responsibility: http://www.igc.org/psr/protect-child.htm

Environment Canada: http://www.ec.gc.ca/eds/fact/index.htm

Appendix 4 - Environmental Toxicology of Pesticides Authorized in Hungary

Appendix 4 presents the environmental toxicity of pesticides authorized in Hungary the according to two organisations. The classifications were taken from the from the European Community (Directive 67/548EEC) and from the IPM (Integrated Pest Management) Programme of the University of Cornell.To make this Appendix easier to read a short repetition of the classifications will follow. Please note that the description of the classification can be found in the single chapters.

Aquatic Toxicity - European Union

	Acute Toxicity			
Symbol	**Fish LC_{50}, mg/L, 96h**	**Daphnia LC_{50}, mg/L, 96h**	**Algae IC_{50}, mg/L 72h**	**Risk Phrase**
N	1	1	1	R50
N	1	1	1	R50/53
N	1 ≥ 10	1 ≥ 10	1 ≥ 10	R51/53
-	10 ≥100	10 ≥100	10 ≥100	R52/53
-	-	-	-	R52

The Risk Phrases in the aboveTable mean the following:

R50: Very toxic to aquatic organisms
R51: Toxic to aquatic organisms
R52: Harmful to aquatic organisms
R53: May cause long-term adverse effects in the aquatic environment
R54: Toxic to flora.
R55: Toxic to fauna.
R56: Toxic to soil organisms.
R59: Dangerous for the ozone layer.

Combined Risk Phrases should be read with a ‘comma’ between the phrases, as in R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Source: European Community (1993): Document 393L0021, Council Directive 93/21/EEC of 27 April 1993 adapting to technical progress for the 18th time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substance, Official Journal L 110, Brussels, Belgium

Ecological Impact - University of Cornell

Source: IPM Programme, Cornell University, New York State Agricultural Experiment Station Geneva (1999):A Method to Measure the Environmental Impact of Pesticides, accessible through http://www.nysaes.cornell.edu/ipmnet/ny/Programme_news/EIQ.html, New York, USA

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
clofentezine	74115-24-5	AC			4	16,1	9	9	52,8	1	86,9
fenazaquin	120928-09-8	AC	N	50/53							
fenbutatin-oxide	13356-08-6	AC	N	50/53	3,7	3,2	5	3	17,6	2	28,8
hexythiazox	78587-05-0	AC	N	50/53	6	25	9	9	52,8	1	95,8
propargite	2312-35-8	AC	N	50/53	6	25	9	9	39,2	1	82,2
dinocap	39300-45-3	AC, FU			12	15	3	3	15,9	1	36,9
amitraz	33089-61-1	AC, IN			6,5	3	9	3	18,2	3	33,2
DDVP (dichlorvos)	62-73-7	AC, IN	N	50	3	9,6	15	15	19,2	1	58,8
endosulfan	115-29-7	AC, IN	N	50/53	7	25	27	9	17,6	1	78,6
lambda cyhalothrin	91465-08-6	AC, IN	N	50/53	2,7	25	3	15	17,5	1	60,5
malathion	121-75-5	AC, IN			4,5	5	3	15	21	1	44
aldicarb	116-06-3	AC, IN, NE	N	50/53	14	3	30	3	16,4	5	52,4
phosalone	2310-17-0	AC,IN	N	50/53	3,6	16,1	3	3	17,4	2	39,5
pirimiphos-methyl	29232-93-7	AC,IN									
pyridaben	96489-71-3	AC,IN	N	50/53	3,1	16,1	6,2	46,5	54,6	1	123,3
permethrin	52645-53-1	AD,IN,AC			8,5	25	9	45	61,8	1	140,8
copper hydroxide	20427-59-2	BA, FU			5,1	10,8	24,3	9,3	38,3	1	82,7
azoxystrobin	131860-33-8	FU	N	50/53	5	15	6	3	12,6	3	36,6
benomyl	17804-35-2	FU			50	25	15	15	73,5	5	128,5
captan	133-06-2	FU	N	50	8	5	6	9	29,9	1	49,9

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
carbendazim	10605-21-7	FU									
carboxin	5234-68-4	FU			5,5	15	15	3	12,4	1	45,4
chlorothalonil	1897-45-6	FU	N	50/53	11	25	12	15	50	1	102
copper sulfate (anhydrous)	7758-98-7	FU	N	50/53							
cymoxanil	57966-95-7	FU	N	50/53	5,5	3	3	3	12,4	3	21,4
cyproconazole	94361-06-5	FU	N	50/53							
dichlofluanid	1085-98-9	FU	N	50/53							
diclobutrazol	75736-33-3	FU	N	51/53							
dimethomorph	110488-70-5	FU	N	51/53	10,1	3	9,1	9,1	37,5	1	58,7
dinitro cresol	534-52-1	FU	N	50/53							
diphenylamine	122-39-4	FU	N	50/53							
dithianon	3347-22-6	FU	N	50/53							
dodine	2439-10-3	FU	N	50/53	16,4	15	9,2	9,3	34,4	1	67,9
epoxiconazole	106325-08-0	FU	N	51/53							
ethoxyquin	91-53-2	FU									
fenarimol	60168-88-9	FU	N	51/53	23	25	9	3	10	5	47
fenpropimorph	67564-91-4	FU	N	51/53							
fentin hydroxide	76-87-9	FU	N	50/53	5	18	12	9	30	1	69
fluquinconazole	136426-54-5	FU	N	50/53							
flusilazole	85509-19-9	FU	N	51/53	9	18	39,8	9	15	1	81,8
folpet	133-07-3	FU	N	50	5,7	10,8	12,2	9,3	20,6	1,6	52,9

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
fosetyl-al	39148-24-8	FU			7	1	3	3	15	1	22
fuberidazole	3878-19-1	FU	N	50/53							
guazatine	108173-90-6	FU	N	50/53							
hexaconazole	79983-71-4	FU	N	51/53							
hymexazol	10004-44-1	FU		50/53							
imazalil	35554-44-0	FU	N	50/53	3,9	13,8	1,5	3,3	14,3	1,6	32,9
iprodione	36734-19-7	FU	N	50/53	3,1	15	6,2	9,3	38,3	1	68,7
kresoxim-methyl	143390-89-0	FU	N	50/53							
mancozeb	8018-01-7	FU			17	25	12	15	78	1	130
metalaxyl	57837-19-1	FU			11	1	6	9	52,5	5	68,5
metiram	9006-42-2	FU			16	5	27	15	54,8	1	101,8
myclobutanil	88671-89-0	FU	N		13,8	13,7	12,2	9,3	38,3	1,6	73,4
oxycarboxin	5259-88-1	FU		52/53							
prochloraz	67747-09-5	FU	N	50/53							
propiconazole	60207-90-1	FU			14,6	3	9,1	9,1	30,6	1	51,7
quinoxyfen	124495-18-7	FU	N	50/53							
spiroxamine	118134-30-8	FU	N	50/53							
sulfur	7704-34-9	FU			6	3,6	15	15	87	1	120,6
tetraconazole	112281-77-3	FU	N	51/53							
thiabendazole	148-79-8	FU	N	50/53							
thiophanate-methyl	23564-05-8	FU	N	50/53	28	9	9	15	63,5	1	96,5
tolylfluanid	731-27-1	FU	N	50/53							

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
triadimefon	43121-43-3	FU	N	51/53	10	9	9	9	35	3	62
triflumizole	68694-11-1	FU			7,8	5	8,1	9,3	38,3	1	60,7
tridemorph	24602-86-6	FU	N	50/53							
triforine	26644-46-2	FU			25,9	13,7	12,2	9,3	38,3	1,6	73,4
triphenyltin acetate	900-95-8	FU	N	50/53							
vinclozolin	50471-44-8	FU	N	51/53	7,2	5	9,2	9,3	33,2	1	56,7
zineb	12122-67-7	FU			23	10,8	12	9	37,1	3	68,9
ziram	137-30-4	FU			13,2	3	24,3	9,3	31	1	67,6
dazomet	533-74-4	FU, IN, NE, HB	N	50/53							
aluminum phosphide	20859-73-8	FUM									
magnesium phosphide	12057-74-8	FUM	N	50							
metam sodium, dihydrate	137-42-8	FUM	N	50/53							
2,4-D	94-75-7	HB		52/53	7	3	18	9	60	1	90
acetochlor	34256-82-1	HB	N	50/53							
alachlor	15972-60-8	HB	N	50/53	6	9	3	3	25	3	40
atrazine	1912-24-9	HB	N	50/53	9,5	9	9	9	51	5	78
benfluralin	1861-40-1	HB			6,6	25	7,7	6,4	35,7	1	74,7
bensulfuron methyl	83055-99-6	HB	N	51/53							
bentazone	25057-89-0	HB		52/53	11	3	18	9	51	5	81
benzoylprop ethyl	22212-55-1	HB	N	50/53							

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
bromoxynil phenol	1689-84-5	HB			4,8	15	17,1	3	17	1	52,1
butylate	2008-41-5	HB			4,5	9	3	3	17	3	32
carfentrazone-ethyl	128639-02-1	HB	N	50/53							
chloroxuron	1982-47-4	HB			9,6	3,4	26,1	9	50,9	3,1	89,4
chlorsulfuron	64902-72-3	HB	N	50/53							
clethodim	99129-21-2	HB			4	6,4	3	3	17	3	29,3
clomazone	81777-89-1	HB			4	3	3	3	17	3	26
clopyralid	1702-17-6	HB	N	51/53							
cyanazine	21725-46-2	HB	N	50/53	7,3	3	3	3	17	3	26
cycloate	1134-23-2	HB			5	9	6	3	17	3	35
dicamba	1918-00-9	HB		50/53	8	1	6	9	30	5	46
dichlobenil	1194-65-6	HB	N	51/53	7	3	6	3	17	5	29
diclofop-methyl	51338-27-3	HB	N	50/53	3	9	6	9	36	1	60
difenzoquat	49866-87-7	HB			4	5	9	9	57,5	1	80,5
dimethachlor	50563-36-5	HB	N	50/53							
dimethenamid	87674-68-8	HB			7,7	10,2	7,4	6,4	35,9	3	59,9
diphenamid	957-51-7	HB		52/53							
diquat dibromide	85-00-7	HB	N	50/53	7	5	27	3	17	1	52
diuron	330-54-1	HB	N	50/53	10,5	15	9	3	9	3	36
EPTC	759-94-4	HB			5	3	6	3	17	3	29
ethalfluralin	55283-68-6	HB			11	25	6	3	17	1	51
ethofumesate	26225-79-6	HB	N	51/53							

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
fenoxaprop-p (+/-)	66441-23-4	HB	N	50/53							
flazasulfuron	104040-78-0	HB	N	50/53							
fluazifop-butyl	69806-50-4	HB	N	50/53	11	15	6	9	51	1	81
fluazifop-p-butyl	79241-46-6	HB	N	50/53							
flufenacet	142459-58-3	HB	N	50/53							
flumioxazin	103361-09-7	HB	N	50/53							
flupyrsulfuron-methyl, sodium salt	144740-54-5	HB	N	50/53							
flurenol	467-69-6	HB	N	51/53							
fluroxypyr	69377-81-7	HB		52/53							
fluroxypyr 1-methyl-heptyl ester	81406-37-3	HB	N	50/53							
fomesafen	72178-02-0	HB			13	3	12	9	50,9	5	74,9
glufosinate-ammonium	77182-82-2	HB			7,3	3	4,7	6,4	35,9	5	50
glyphosate	1071-83-6	HB	N	51/53	7	15	9	9	41,3	1	74,3
glyphosate-trimesium	81591-81-3	HB	N	51/53							
haloxyfop-r	72619-32-0	HB	N	50/53							
hexazinone	51235-04-2	HB	N	50/53							
imazapyr	81334-34-1	HB		52/53	10	2,1	9	3	17	5	31,1
imazethapyr	81335-77-5	HB			7	1	6	9	50,9	5	66,9
ioxynil	1689-83-4	HB	N	50/53							
isoproturon	34123-59-6	HB	N	50/53							

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
isoxaflutole	141112-29-0	HB	N	50/53							
linuron	330-55-2	HB	N	50/53	9	9	27	9	51	3	96
MCPA	94-74-6	HB									
MCPB	94-81-5	HB									
MCPP	7085-19-0	HB									
mecoprop-p	16484-77-8	HB			9,7	1	6	9	50,9	5	66,9
metamitron	41394-05-2	HB	N	50/53							
metolachlor	51218-45-2	HB			7	9	6	3	17	3	35
metoxuron	19937-59-8	HB	N	50/53							
metribuzin	21087-64-9	HB	N	50/53	8	3	27	9	51	5	90
molinate	2212-67-1	HB									
napropamide	15299-99-7	HB			9,3	3	9	3	17	5	32
naptalam	132-66-1	HB			9,1	7,2	8,4	9	50,9	3,1	75,5
nicosulfuron	111991-09-4	HB			8	3,6	6	9	51	5	69,6
oxyfluorfen	42874-03-3	HB			8,5	25	27	9	51	1	112
pendimethalin	40487-42-1	HB	N	50/53	8,5	25	9	3	17	1	54
phenmedipham	13684-63-4	HB			5,5	10,5	13,5	9	40,1	1	73,1
propachlor	1918-16-7	HB	N	50/53							
propanil	709-98-8	HB	N	50	4	3	6	9	50,9	1	68,9
propyzamide	23950-58-5	HB	N	50/53	10	5	9	9	51	1	74
prosulfuron	94125-34-5	HB	N	50/53	8,7	1	7,4	6,4	35,9	5	50,7
pyrazon	1698-60-8	HB	N	50/53	7	3	9	3	20	5	35

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
pyridate	55512-33-9	HB	N	50/53	3	10,8	6	9	51	1	76,8
quinclorac	84087-01-4	HB									
quizalofop-ethyl	76578-14-8	HB			7,6	25	9	45	50,9	1	129,9
quizalofop-p-tefuryl	119738-06-6	HB	N	50/53							
sethoxydim	74051-80-2	HB			4,9	3,6	6	9	51	2,9	69,6
terbacil	5902-51-2	HB			11	3	9	3	12,5	5	27,5
thiobencarb	28249-77-6	HB	N	50/53							
triasulfuron	82097-50-5	HB	N	50/53							
tribenuron methyl	101200-48-0	HB									
triclopyr	55335-06-3	HB			9,5	3	9	9	51	5	72
trifluralin	1582-09-8	HB	N	50/53	8,5	25	9	3	20	1	57
vernolate	1929-77-7	HB	N	51/53							
methyl bromide	74-83-9	HB,AC,IN, NE,FU,R O	N	50/59							
acephate	30560-19-1	IN			4	1	9	15	18,7	1	43,7
avermectin	71751-41-2	IN			10,9	16	5	15	19,2	1	55,1
azinphos-methyl	86-50-0	IN	N	50/53	5	25	30	15	18,3	1	88,3
barium polysulfide	50864-67-0	IN									
bendiocarb	22781-23-3	IN	N	50/53	3,8	9,6	5	15	17,5	2,1	47,1
benfuracarb	82560-54-1	IN	N	50/53							
bensultap	17606-31-4	IN	N	50/53							

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
beta-cyfluthrin	68359-37-5	IN	N	50/53							
butocarboxim	34681-10-2	IN	N	50/53							
carbaryl	63-25-2	IN	N	50	3	9	9	15	19,7	1	52,7
carbosulfan	55285-14-8	IN	N	50/53							
cartap monohydro-chloride	15263-52-2	IN	N	50/53							
chlorpyrifos	2921-88-2	IN	N	50/53	8,5	25	45	15	19,9	1	104,9
cyfluthrin	68359-37-5	IN	N	50/53	7	5	9	45	60	1	119
deltamethrin	52918-63-5	IN	N	50/53	3	16,1	3	15	20,4	2	54,5
diazinon	333-41-5	IN	N	50/53	8	15	30	15	19,5	3	79,5
diflubenzuron	35367-38-5	IN			5,5	5	9	15	69	1	98
dimethoate	60-51-5	IN			9	5	30	45	60,9	3	140,9
dioxacarb	6988-21-2	IN	N	51/53							
esfenvalerate	66230-04-4	IN	N	50/53	4	25	9	45	57,8	1	136,8
etrimfos	38260-54-7	IN									
fenitrothion	122-14-5	IN	N	50/53	5	3	15	15	20,5	3	53,5
fenoxycarb	72490-01-8	IN	N	50/53							
fenthion	55-38-9	IN	N	50/53							
fipronil	120068-37-3	IN			7,1	16,1	36,8	6,3	33,6	1	92,8
heptenophos	23560-59-0	IN									
lufenuron	103055-07-8	IN	N	50/53							
methamidophos	10265-92-6	IN	N	50	11	1	30	45	65,3	5	141,3

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
methidathion	950-37-8	IN	N	50/53	8	15	18	45	61,8	3	139,8
methomyl	16752-77-5	IN	N	50/53	11	15	30	15	21,5	5	81,5
methyl parathion	298-00-0	IN			4	9	3	15	20,7	1	47,7
oxythioquinox	2439-01-2	IN	N	50/53	7	25	27	9	49,1	1	110,1
phenthoate	2597-03-7	IN									
phorate	298-02-2	IN			10	25	45	27	57,6	1	154,6
phosmet	732-11-6	IN			3	15	9	15	17,7	1	56,7
phosphamidon	13171-21-6	IN	N	50/53	8	3	15	15	19,9	5	52,9
piperonyl butoxide	51-03-6	IN			3,7	3,2	9	3	13,5	2	28,7
pirimicarb	23103-98-2	IN	N	50/53	11,4	3,2	24,8	3	15	2	45,9
pyrethrins	8003-34-7	IN	N	50/53	3	16	9	3	17	2	45
pyrethrum powder other than pyrethrins	8003-34-7	IN									
sulfotep	3689-24-5	IN									
tefluthrin	79538-32-2	IN			5,9	15	7,4	28,5	33,4	1	84,3
terbufos	13071-79-9	IN			4	15	15	9	23,8	1	62,8
triazophos	24017-47-8	IN	N	50/53							
bifenthrin	82657-04-3	IN, AC			8,3	16	6,3	18,5	38,1	2	78,9
cyhexatin	13121-70-5	IN, AC	N	50/53	6,2	3,2	18,8	5,7	27,2	2	55
fenpropathrin	39515-41-8	IN, AC	N	50/53	5,1	16	9	45	55,5	2,1	125,5
carbofuran	1563-66-2	IN, NE	N	50/53	29	5	30	15	19,4	5	69,4
oxydemeton-methyl	301-12-2	IN, NE	N	50	29	5	30	27	60,6	5	122,6

pesticide	CAS Number	Use Type	European Union[a]		Evaluation Cornell University (New York)						
			Symbol	Risk Phrases	Fish	Birds	Bees	Beneficial Organism	Groundwater and Runoff Potential	Terrestrial Organisms	Ecological Impact
methiocarb	2032-65-7	IN, RE, MO	N	50/53							
8-hydroxyquinoline sulfate	134-31-6	MB									
bronopol	52-51-7	MB	N	50							
metaldehyde	108-62-3	MO									
fosthiazate	98886-44-3	NE	N	50/53							
oxamyl	23135-22-0	NE, IN	N	51/53	8,5	3	15	9	18,2	1	45,2
chlorpropham	101-21-3	PG, HB			5	15	6	3	17	1	41
chlorophacinone	3691-35-8	RD	N	50/53							
thiram	137-26-8	RE, FU			7,2	15	18,5	9,3	40,8	1	83,5

a. all pesticides with entries in Annex 1 of Council Directive 67/548 are listed in this table. Please note that Symbols and Risk Phrases for health hazards were removed.

Appendix 5 - Pesticide Residues in German Food and Water

Pesticide	CAS Number	Ground Water	Surface Water	Food/ Crop	Nr.
2,4-D	94-75-7	x	x		
alachlor	15972-60-8	x			
atrazine	1912-24-9	x	x	carrots	1
azinphos-methyl	86-50-0	x	x	apple	1
azoxystrobin	131860-33-8			wheat	1
bentazone	25057-89-0	x	x		
beta-cyfluthrin	68359-37-5				
bifenox	42576-02-3	x			
bromopropylate	18181-80-1			apple, cherries canned	2
bromoxynil phenol	1689-84-5	x	x		
captan	133-06-2			apple, pear, cherries canned, strawberries, table wine, cauliflower, Chinese cabbage, lettuce	8
carbaryl	63-25-2			apple	1
carbendazim	10605-21-7			apple, strawberries, cauliflower, celery root, cucumber, lettuce, linnen seed, frozen peas, potatoes, savoy	10
carbofuran	1563-66-2	x	x	strawberries	1
chlorotoluron	15545-48-9	x	x		
chlorpropham	101-21-3			potatoes	1
chlorpyrifos	2921-88-2			apple, pear, cherries canned, table wine, cauliflower, carrots, celery root, zucchini	8
chlorpyrifos-methyl	5598-13-0	x		oats, strawberries, Chinese cabbage	3
cyanazine	21725-46-2	x			
cyfluthrin	68359-37-5	x		zucchini	1
zeta- cypermethrin (stereochemistry unspecified)	52315-07-8	x		cherries canned, broccoli, celery root, Chinese cabbage, lettuce, savoy, zucchini	7
DDVP	62-73-7	x		wheat, carrots, potatoes, savoy, sunflower seed	5
deltamethrin	52918-63-5	x		wheat, apple, table wine, frozen spinach	4
diazinon	333-41-5	x	x	wheat, rye, cauliflower	3
dicamba	1918-00-9	x			
dichlobenil	1194-65-6	x			
dichlofluanid	1085-98-9	x		wheat, rye, apple, pear, strawberries, table wine, cauliflower, carrots, celery root, Chinese cabbage, cucumber, onion, potatoes	13
diflubenzuron	35367-38-5	x			

Pesticide	CAS Number	Ground Water	Surface Water	Food/ Crop	Nr.
dimethoate	60-51-5	x	x	wheat, rye, apple, cherries canned, asparagus, cauliflower, carrots, celery root, Chinese cabbage, cucumber, linnen seed, potatoes, savoy, frozen spinach	14
diphenylamine	122-39-4			wheat, rye, apple, strawberries, potatoes	5
diuron	330-54-1	x	x		
endosulfan	115-29-7	x	x	apple, cherries canned, strawberries, broccoli, carrots, Chinese cabbage, linnen seed, onion, frozen peas, frozen spinach, zucchini	11
ethephon	16672-87-0	x			
ethofumesate	26225-79-6	x			
etrimfos	38260-54-7	x		cucumber, linnen seed,	2
fenitrothion	122-14-5		x		
fenpropathrin	39515-41-8			cucumber	1
fenpropimorph	67564-91-4			rye, celery root, savoy	3
fenthion	55-38-9	x		sweet cherries	1
fenuron	101-42-8	x	x		
fluorochloridone	61213-25-0	x			
fluroxypyr	69377-81-7	x			
folpet	133-07-3			cherries canned, broccoli, cauliflower, Chinese cabbage	4
glyphosate	1071-83-6		x		
haloxyfop-r	72619-32-0	x			
hexazinone	51235-04-2	x	x		
imazalil	35554-44-0			cherries canned, cauliflower, cucumber	3
ioxynil	1689-83-4	x	x		
iprodione	36734-19-7			wheat, cherries canned, strawberries, carrots, Chinese cabbage, cucumber, lettuce, linnen seed, frozen peas, potatoes, savoy, frozen spinach	12
isoproturon	34123-59-6	x	x		
lambda cyhalothrin	91465-08-6	x		cherries canned, frozen spinach	2
lenacil	01.08.2164		x		
linuron	330-55-2	x	x		
malathion	121-75-5			wheat, rye, oats, apple, linnen seed	5
MCPA	94-74-6	x	x		
MCPB	94-81-5	x			
MCPP	7085-19-0	x	x		
metalaxyl	57837-19-1	x	x	wheat, broccoli, Chinese cabbage, lettuce, potatoes	5
metamitron	41394-05-2	x	x		
metazachlor	67129-08-2	x	x		

Pesticide	CAS Number	Ground Water	Surface Water	Food/ Crop	Nr.
methamidophos	10265-92-6			Chinese cabbage, lettuce	2
methidathion	950-37-8	x			
methyl bromide	74-83-9			wheat, rye, oats, broccoli, linnen seed	5
methyl parathion	298-00-0	x	x	apple, carrots, celery root, mushroom cultivated (Agaricus), potatoes	7
metobromuron	3060-89-7	x			
metolachlor	51218-45-2	x	x		
metoxuron	19937-59-8	x	x		
metribuzin	21087-64-9	x	x		
myclobutanil	88671-89-0			strawberries, cucumber	2
napropamide	15299-99-7		x		
oxydemeton-methyl	301-12-2			cauliflower, zucchini	2
penconazole	66246-88-6		x	cucumber	1
pendimethalin	40487-42-1	x	x		
permethrin	52645-53-1	x		broccoli, kale, mushroom cultivated (Agaricus), savoy, frozen spinach	7
phosalone	2310-17-0			apple, plum, cherries canned	3
pirimicarb	23103-98-2	x		apple, broccoli, Chinese cabbage, lettuce, linnen seed, frozen peas, zucchini	7
pirimiphos-methyl	29232-93-7	x		wheat, rye, oats, linnen seed	4
procymidone	32809-16-8			apple, cherries canned, strawberries, table wine, asparagus, broccoli, carrots, Chinese cabbage, cucumber, linnen seed, frozen peas, zucchini	12
prometryn	7287-19-6	x	x		
propyzamide	23950-58-5	x		strawberries, Chinese cabbage, potatoes, savoy, zucchini	5
pyrazon	1698-60-8	x	x		
quinmerac	90717-03-6		x		
tebuconazole	107534-96-3		x		
terbuthylazine	5915-41-3	x	x		
terbutryn	886-50-0	x	x		
thiabendazole	148-79-8			wheat, pear, strawberries, asparagus, carrots, cucumber, kale, potatoes, savoy	9
tolylfluanid	731-27-1			apple, strawberries, linnen seed, frozen peas	4
triadimefon	43121-43-3			celery root, savoy, frozen spinach	3
triadimenol	55219-65-3	x		rye, strawberries	2
triclopyr	55335-06-3	x			
trifluralin	1582-09-8		x	Chinese cabbage, linnen seed, frozen peas	3

Pesticide	CAS Number	Ground Water	Surface Water	Food/ Crop	Nr.
vinclozolin	50471-44-8	x		wheat, cherries canned, strawberries, table wine, broccoli, cauliflower, carrots, Chinese cabbage, kale, lettuce, linnen seed, mushroom cultivated (Agaricus), onion, frozen peas, savoy, frozen spinach, zucchini	19

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Appendix 6 - List of laws related to plant protection products issues in Hungary

Act on Plant Protection

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Act LVII 1995 on water management, Hungarian Official Journal, No. 53, pp. 2833-2846.

Act LIII 1996 on the protection of nature, Hungarian Official Journal, No. 53, pp. 3305-3325.

National Assembly Resolution 83/1997 (26. IX.) on the National Environmental Protection Programme, Hungarian Official Journal, No. 82, pp. 5816-5846

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