Message in a Bottle

BRIEFING

April 2008

Pesticide Action Network Europe

Pesticide Action Network Europe

PAN Europe is a network of grass roots organisations working to replace the use of hazardous pesticides with ecologically sound alternatives.

Our vision is of a world where high agricultural productivity is achieved through sustainable farming systems in which agrochemical inputs and environmental impacts are minimised, and where local communities control food production using local varieties.

PAN Europe brings together consumer, health and environmental organisations, trades unions, women's groups and farmer associations. Our formal network membership includes 32 organisations based in 19 countries.

Pesticide Action Network Europe
Development House
56-64 Leonard Street
London EC2A 4LT
Tel: +44 (0) 207 065 0920
Fax: +44 (0) 207 065 0907
Email: coordinator@pan-europe.info
Web: www.pan-europe.info

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Executive Summary

In the first investigation of its kind, PAN Europe, together with Greenpeace Germany, Mouvement pour le Droit et le Respect des Générations Futures (MDRGF) and Global 2000, purchased 40 bottles of wine from retail outlets across the EU and sent them to commercial laboratories to be analysed for the presence of pesticides.

Every bottle of conventional wine contained pesticides. On average four different pesticides were detected per bottle. Sixteen conventional wines contained EU-classified carcinogens, mutagens or endocrine disruptors. Fourteen others contained substances recognised as 'likely' or 'possible' carcinogens by the United States Environmental Protection Agency.

Three of the wines containing pesticides were produced by world famous chateaux in Bordeaux, including three Grand cru classés. Five bottles of organic wine included in the analysis were entirely free of pesticide residues.

Judged against EU standards on drinking water, none of the conventional wines would have been approved for human consumption. On average, pesticides were present at levels 230 times higher than legally permitted in drinking water.

These results suggest that pesticides are commonplace and widespread among samples of conventional wine. This scenario is supported by a study from the French Ministry of Agriculture which documented the systematic transfer of pesticides into wines.

One third of the pesticides detected in the conventional wines were not used in European grape production prior to 1994. A further 30% of residues relate to classes of pesticide whose use in grape production has escalated substantially over the same period.

The application of synthetic pesticides to European vineyards has increased by 27% since 1994. Grapes now receive a higher dose of synthetic pesticides (active substances) than any other major crop, except citrus. Two grams of synthetic pesticides are applied for every three kilos of grapes harvested.

Grapes rank among the most contaminated fruits sold in the European Union. According to data from the European Commission, some 57% of grapes contain at least one pesticide, while an additional 5% contain pesticides above legal limits.

The EU is the world's largest wine producer, accounting for over two thirds of global production. EU wine exports generate €5.5 billion in revenues per annum and represent 11.6% of the EU's agricultural sales. Italy, France and Spain account for two thirds of wines traded internationally.

These findings present a compelling case for the elimination of hazardous pesticides from use in food production and their replacement by less toxic and non-chemical alternatives.

Introduction

The abundance of pesticide residues in food items sold across the European Union is a highly documented problem. Tens of thousands of fruits and vegetables are sent for laboratory analysis each year and the results are published by the European Commission. Latest figures show 41% of food items tested contain pesticides, with an addition 4.7% showing concentrations of pesticides above legal limits. Some of the most hazardous pesticides are among those detected most frequently.

Yet there are many foods whose level of pesticide contamination is little known. This is particularly true of processed foods which account for just 5% of food samples analysed throughout the EU. Wine is one such product: a prestige commodity seldom publicly tested for the presence of pesticides.

It was against this backdrop that PAN Europe, together with Greenpeace Germany, MDRGF and Global 2000, launched a groundbreaking study into the presence of pesticides in wine. In the first investigation of its kind, 40 bottles of wine were purchased from across the EU and sent to commercial laboratories for scientific analysis.

When the results were first published they sparked a minor international news story, and were reported in newspapers such as USA Today and the International Herald Tribune, as well as Sueddeutsche Zeitung, Liberation and Bild. Pesticides showed up in every bottle of conventional wine. On average, each wine contained pesticide concentrations 230 times higher than would be legally allowed in drinking water. Almost half the bottles contained EU-classified carcinogens, reproductive toxins and endocrine disruptors.

The present study demonstrates the extent and durability of pesticides in the food chain. Pesticides applied to vineyards transfer into wines and survive as residues for years after they were first sprayed onto grapes. Dietary exposure is not confined to fruits and vegetables: high value processed foods were shown to contain pesticides too.

From the perspective of consumer protection the message in a bottle is clear: hazardous pesticides should be replaced from use in global food production. Less toxic and non-chemical pest control alternatives should be adopted throughout the food chain.

Proposals by the European Commission to withdraw carcinogenic, mutagenic, reprotoxic and endocrine disrupting pesticides should be strengthened, augmented and passed into law. Food retailers should work with farmers to reduce and eliminate the application of all other hazardous pesticides applied to foods grown internationally.

The World of Wine

Europe dominates the world of wine, producing over two thirds of the 28 billion litres manufactured globally[1]. Italy, France and Spain are all leading wine producers, together accounting for over 50% of world production. Germany also ranks among the global top 10. Wine consumption follows a similar pattern, with Europe accounting for 67.4% of the global total. France, Italy, Germany, Spain, UK, Romania and Portugal rank among the top 10 wine consuming countries, while the French drink more than 1 litre of wine per week. Per capita Europe consumes five times more wine than any other part of the world[2]. Wine imports to the European Union are dominated by Australia (35.9%), Chile (18.1%) and South Africa (15.7%).

Background

Since the late 1980s, European agriculture has witnessed a gradual shift towards pesticides active at lower doses. Less potent substances have been partially replaced by more powerful toxins capable of impacting on pest species in smaller concentrations. Nowhere has this trend been more evident than in the production of grapes.

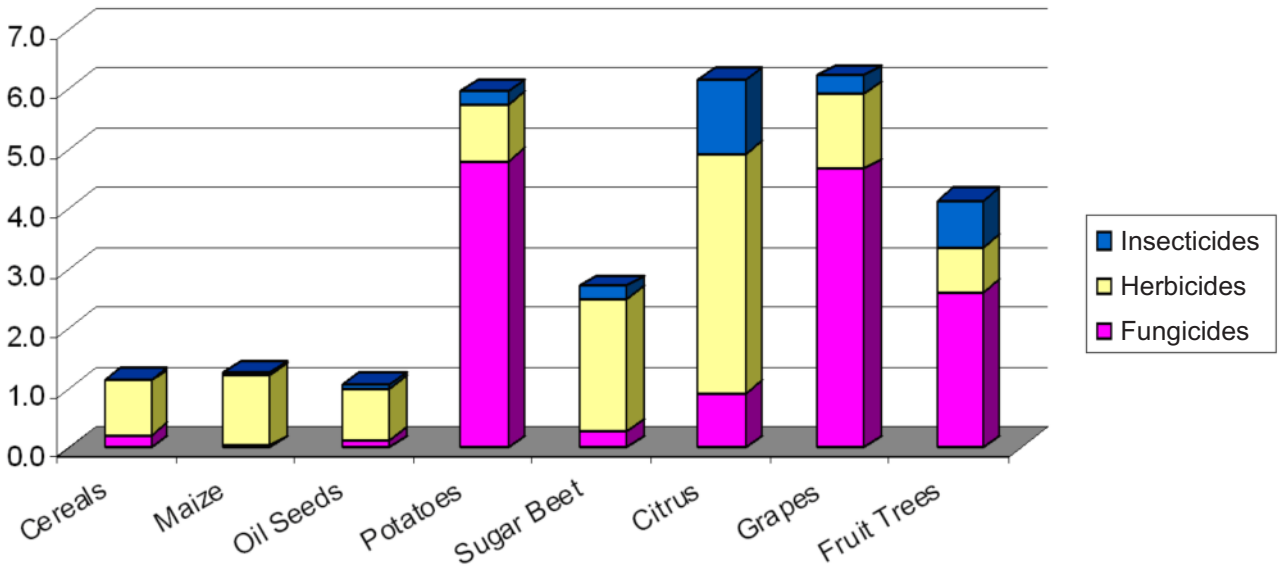
Vineyards have traditionally been treated with large quantities of inorganic sulphur; a relatively non-hazardous fungicide used to protect against powdery mildew. Yet in the ten year period leading to 2003, the application of inorganic sulphur to EU grapevines declined steadily from 84,900 tonnes to 52,300 tonnes, an overall decrease of around 40 percent[3]. Over the same period the application of synthetic fungicides grew by 27%. Use of dithiocarbamates, organophosphates, dinitrophenols and pyrimidine fungicides all increased, while other groups of synthetic fungicides never before applied to European grapes were adopted for the first time: morpholines, strobilurines, anilides, carbamates, phenylpyrroles.

On the Grapevine

By 2003, grapes received a higher dose of synthetic pesticides than any other major crop except citrus. Some 4.7kg of synthetic pesticides (active substances) were applied per hectare of vineyard – a rate equivalent to two grams of pesticide for every three kilos of grapes harvested. While accounting for just 3.5% of EU cropland, grapes received 15% of the synthetic pesticides applied to major crops.

Many pesticides used in vineyards are routinely detected as residues in grapes. Indeed grapes rank among the most contaminated major fruit items sold in the EU. Of the grapes analysed under the EU coordinated food monitoring programme, 57% tested positive for at least one pesticide, while an additional 5% contained pesticides in excess of legal limits[4]. A little over one third of grape samples tested were pesticide-free.

Dose of synthetic pesticides applied to major EU crops (KgAS/Ha)



Source: The use of plant protection products in the European Union: Data 1992-2003, European Commission (2007)

Systematic pesticide transfer into wine

Pesticides detected in grapes are also transferred into wines. In 2005, the French Ministry of Agriculture published a 14-year study incorporating data from wine producing regions across France[5]. 1,316 grape samples entering the wine making process were assessed for the presence of pesticides. Then, once wine production was complete, the vintages derived from the grape samples were also analysed for pesticide contamination.

The French study found that around 30% of pesticide substances included within the analysis could be transferred into wines, including 15 pesticides 'systematically' detected in both grapes and the resultant wines. These pesticides included seven synthetic fungicides linked with known hazards to human health (see Table 1).

Table 1: Some of the 15 pesticides 'systematically' transferred into wine

Pesticide	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptors	Rate of Transfer
iprodione	Yes[1]			100%
procymidone	Yes[1]	Yes[2]	Yes[3]	93%
azoxystrobin				90%
iprovalicarb	Likely[4]			86%
pyrimethanil	Possible[5]			85%
oxadixyl	Possible[5]			53%
vinclozolin	Possible[5]			36%

KEY

1) Classified as a carcinogen under the EU Directive on Dangerous Substances
2) Classified as a reprotoxin under the EU Directive on Dangerous Substances
3) Classified as an endocrine disruptor (category 1) under EU COM(1999)706
4) Listed as a 'likely' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
5) Listed as a 'possible' carcinogen under the US EPA (Pesticide Programs) Carcinogen List

The active substance with the highest rate of transfer was iprodione, which was detected in 100% of wine samples made from grapes that were contaminated with this pesticide. Procymidone (93%), azoxystrobin (90%), iprovalicarb (86%) and pyrimethanil (85%) also showed a transfer rate into wines prepared from contaminated grapes.

Methodology

In the spring of 2008, 40 bottles of wine were purchased from retail outlets across the EU and sent to commercial laboratories to be tested for the presence of pesticides. The wines included 34 bottles produced conventionally, as well as six organic samples. The conventional wines included 10 French wines, 10 German wines, seven Austrian wines, three Italian wines, one Portuguese wine, one South African wine, one Australian wine and one wine from Chile. Three organic wines were produced in France and three in Austria.

Most of the samples sent for analysis were table wines selected from mainstream producers. Three bottles of Bordeaux, however, were purchased from world famous chateaux: including two Pessac-Léognan Grand cru classés and one Saint Estèphe Grand cru classé. Such bottles are highly celebrated and retail at over €200 per bottle.

Wine sampling was overseen in Germany by Greenpeace, in Austria by Global 2000, and in France by MDRGF.

International Trade

Since the mid-1990s, the EU has overtaken the USA as the world's largest agricultural exporter, with food exports of US$ 73 billion[6]. Europe's new position as a leader in agricultural sales[7] has been achieved by emphasising lucrative products including wine, liquor and cheese over cheaper food commodities. In 2006, extra-EU wine exports generated €5.5 billion in revenues for the EU, accounting for 11.6% of EU agricultural sales. Italy, France, and Spain are the world's leading wine exporters, selling around two thirds of wines traded internationally[8].

Results

All 34 bottles of conventional wine sent for analysis were shown to contain pesticide residues. The average number of pesticides per bottle was 4.4, while the highest diversity of pesticides in a single bottle was 10. One hundred and forty eight separate pesticide residues were present in total.

Twenty four different pesticides were identified in the wines, of which five are classified as carcinogenic, mutagenic or reprotoxic by the EU. A further three pesticides are suspected carcinogens. Four more are classed as hazardous by the World Health Organisation.

The most concentrated individual residue was detected as 586µg/l, while the mean residue concentration stood at 23.6µg/l (SD=36.9µg/l). The highest sum total pesticide concentration was 741µg/l, while the average figure was 98.3µg/l (SD=163.1µg/l). The lowest sum total pesticide concentration was 1.9µg/l.

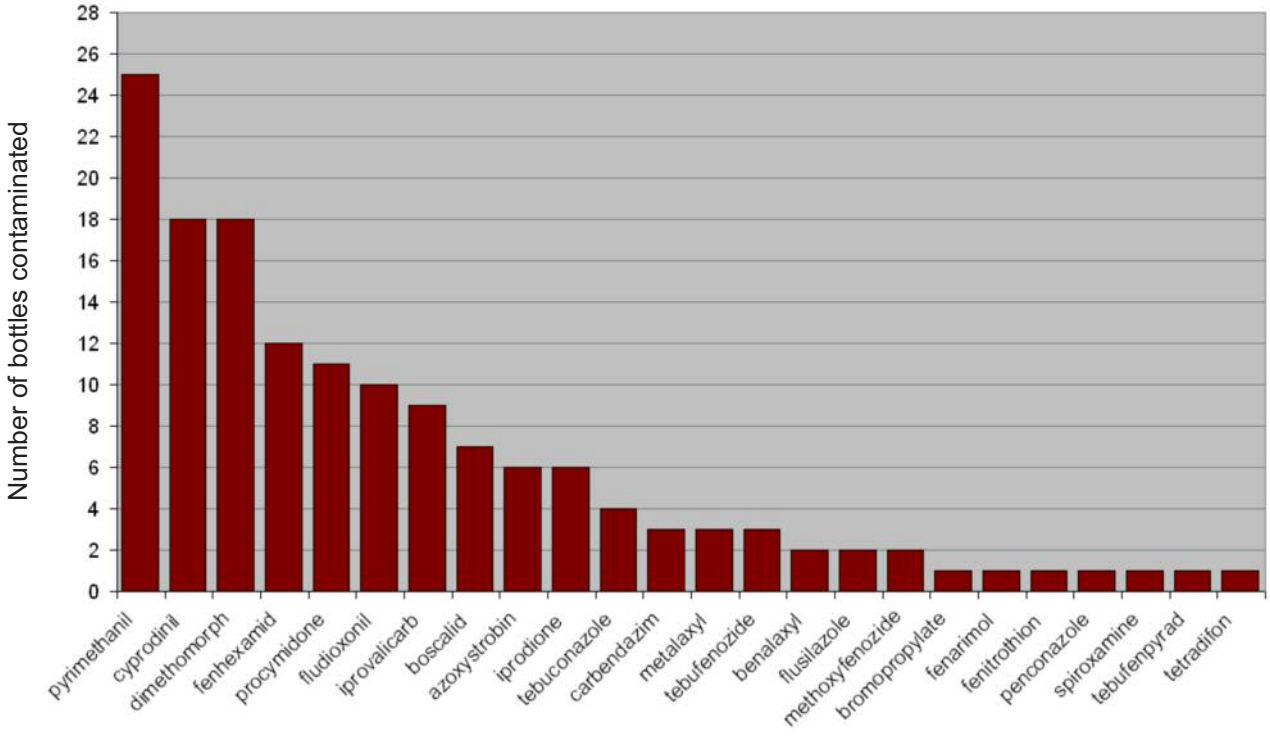
Four pesticides (pyrimethanil, cyprodinil, dimethomorph, fenhexamid) accounted for nearly 50% of the total residues detected, while seven pesticides were detected in only one sample. The most widespread pesticide contaminant was pyrimethanil, a possible carcinogen, which was detected in 25 bottles of conventional wine – almost 75% of all conventional samples analysed.

Fungicides accounted for 18 of the 24 pesticide substances, and 93.1% of the 148 residues detected. Insecticides accounted for six pesticide substances and 6.1% of the residues detected. No herbicide residues were detected.

Pesticide residues were found in all three Grand cru classés vintages at concentrations of up to 234µg/l. All three bottles contained procymidone – an EU-classified carcinogen, reprotoxin and endocrine disruptor. The most heavily contaminated bottle contained a sum total pesticide concentration of 302.9µg/l.

Of the six bottles of organic wine tested, five contained no detectable pesticide residues. These were the only wine samples shown to be pesticide-free. One organic sample contained 7.6µg/l of pyrimethanil, a possible carcinogen.

Incidence of contamination: analysis of 34 bottles of conventional wine



Results

Table 2: Pesticide residues in conventional wines

		Number of different pesticides detected	Total pesticide concentration (µg/l)	Highest residue (µg/l)	Lowest residue (µg/l)	Hazardous properties of pesticides detected
France	1	5	58.5	55.0	trace	carcinogen, reprotoxin, endocrine disruptor
	2	9	55.3	29.4	trace	carcinogen, mutagen, reprotoxin, endocrine disruptor
	3	3	19.3	17.0	<1	possible carcinogen
	4*	3	16.7	8.6	1.3	carcinogen, reprotoxin, endocrine disruptor
	5*	2	302.9	233.8	69.1	carcinogen, reprotoxin, endocrine disruptor
	6*	5	34.1	13.2	trace	carcinogen, reprotoxin, endocrine disruptor
	7	8	23.2	14.2	trace	carcinogen, mutagen, reprotoxin, endocrine disruptor
	8	3	195.0	160.0	15.0	carcinogen, reprotoxin, endocrine disruptor
	9	2	19.0	12.0	7.0	carcinogen, reprotoxin, endocrine disruptor
	10	3	267.0	140.0	17.0	carcinogen, reprotoxin, endocrine disruptor
Austria	11	4	82.0	48.0	7.0	likely carcinogen
	12	2	17.0	9.0	8.0	
	13	1	4.0	4.0	4.0	possible carcinogen
	14	3	49.0	32.0	2.0	likely carcinogen
	15	3	15.0	6.0	4.0	possible carcinogen
	16	4	60.0	34.0	4.0	likely carcinogen
	17	3	35.0	23.0	5.0	possible carcinogen
Germany	18	4	38.6	26.0	2.0	possible carcinogen
	19	7	39.8	12.0	2.4	likely carcinogen
	20	10	223.2	60.0	4.0	likely carcinogen
	21	2	24.0	22.0	2.0	
	22	8	90.6	31.0	2.0	likely carcinogen
	23	6	741.0	450.0	3.2	possible carcinogen, reprotoxin, endocrine disruptor
	24	5	55.2	17.0	3.5	possible carcinogen
	25	1	5.5	5.5	5.5	
	26	8	62.4	16.0	2.9	likely carcinogen
	27	4	57.9	19.0	5.9	likely carcinogen
Italy	28	6	9.2	2.7	<1	carcinogen, reprotoxin, endocrine disruptor
	29	1	1.9	1.9	1.9	
	30	8	35.0	11.6	<1	carcinogen, reprotoxin, endocrine disruptor, neurotoxin
Portugal	31	3	9.4	8.4	trace	carcinogen
South Africa	32	2	24.6	24.6	trace	carcinogen, reprotoxin
Australia	33	4	40.6	18.4	<1	carcinogen, mutagen, reprotoxin
Chile	34	6	591.3	586.0	trace	carcinogen, reprotoxin
	Mean	4.4	97.2			

*Grand cru classés

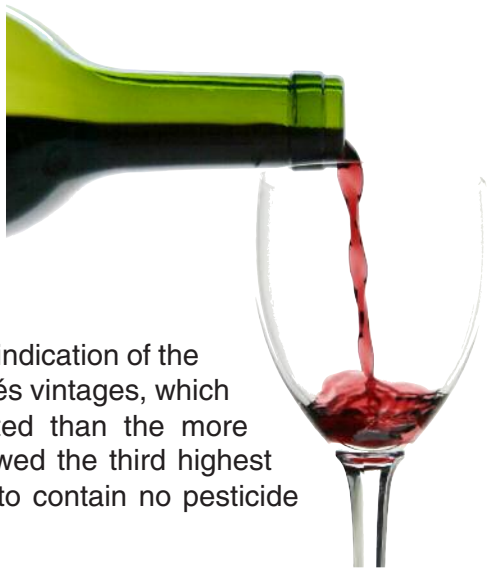
Table 3: Summary of pesticides found in conventional wines

Pesticides Identified	Number of bottles contaminated	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class	Use
azoxystrobin	6						Fungicide
benalaxyl	2						Fungicide
boscalid	7						Fungicide
bromopropylate	1						Insecticide
carbendazim	3		Yes[2,3]				Fungicide
cyprodinil	18						Fungicide
dimethomorph	18						Fungicide
fenarimol	1		Yes[3]	Yes[4]			Fungicide
fenhexamid	12						Fungicide
fenitrothion	1				Yes[9]	II[7]	Insecticide
fludioxonil	10						Fungicide
flusilazole	2	Yes[1]	Yes[3]			III[8]	Fungicide
iprodione	6	Yes[1]					Fungicide
iprovalicarb	9	Likely[5]					Fungicide
metalaxyl	3					III[8]	Fungicide
methoxyfenozide	2						Insecticide
penconazole	1						Fungicide
procymidone	11	Yes[1]	Yes[3]	Yes[4]			Fungicide
pyrimethanil	25	Possible[6]					Fungicide
spiroxamine	1					II[7]	Fungicide
tebuconazole	4	Possible[6]				III[8]	Fungicide
tebufenozide	3						Insecticide
tebufenpyrad	1						Insecticide
tetradifon	1						Insecticide
TOTAL	**148**						

1) Classified as a carcinogen under the EU Directive on Dangerous Substances
2) Classified as a mutagen under the EU Directive on Dangerous Substances
3) Classified as a reprotoxin under the EU Directive on Dangerous Substances
4) Classified as an endocrine disruptor (category 1) under EU COM(1999)706
5) Listed as a 'likely' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
6) Listed as a 'possible' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
7) Listed as Class II under the World Health Organisation classification of pesticides by hazard
8) Listed as Class III under the World Health Organisation classification of pesticides by hazard
9) A cholinesterase inhibitor

Discussion

While the present study focuses on a relatively small sample of conventional wines, the identification of pesticide residues in 100% of samples tested suggests that contamination is a widespread phenomenon among conventional wines. This scenario is supported by data from the French Ministry of Agriculture which shows that a significant proportion of pesticide substances present in grapes are systematically transferred during the wine-making process.



The results also suggest that the 'quality' of the wine gives no indication of the degree of pesticide contamination. The three Grand cru classés vintages, which were each purchased for over €200, were no less affected than the more affordable wines. Indeed, one Grand cru classés bottle showed the third highest total pesticide concentration. The only wine samples found to contain no pesticide residues were those prepared from organic grapes.

Hazard pesticides

Hazardous pesticides were present in up to 90% of the conventional wines analysed. Sixteen of the 34 bottles contained pesticides classified by the EU as being either carcinogenic, mutagenic, reprotoxic or as being endocrine disruptors. Fourteen others contained substances recognised as 'likely' and/ or 'possible' carcinogens by the United States Environmental Protection Agency. Only four conventional wines analysed did not contain pesticide residues with known or suspected hazardous properties.

The proportion of hazardous pesticides among the total substances detected was lower. Eight of the 24 pesticides detected are recognised as having known or suspected hazardous properties. Thus the high proportion of wines affected by hazardous pesticides was partly due to the number of different pesticides per bottle and the fact that some of the hazardous pesticides were among the most widespread.

Legal limits on pesticides

The EU establishes no legal limits on the concentration of pesticides found in wine. Maximum Residue Limits (MRLs) apply only to raw agricultural produce, for example grapes. Given the absence of limits for wine, the pesticide residues detected above entailed no legal violations.

It should be noted also that the presence of pesticides in wine provides no indication of the concentration at which pesticides were initially present in grapes. The study by the French Ministry of Agriculture documented the systematic transfer of pesticides into wines derived from grapes containing pesticides below the Maximum Residue Limit. There is therefore no reason to suggest that the wines analysed above were prepared from grapes containing abnormally or illegally high levels of pesticides.

From Wine to Water

While the EU provides no legal limits on the concentration of pesticides in wine, it is highly informative to evaluate the results against existing legislation on the quality of drinking water. The EU Drinking Water Directive (98/83/EC)[9] dictates that water intended for human consumption may not contain pesticide residues at concentrations above 0.1µg/l, while the sum total concentration of all pesticides must fall below 0.5µg/l.

Judged against these standards, none of the conventional wines analysed would have been approved for human consumption. All 34 samples contained pesticide residues at concentrations above 0.1µg/l. The average residue concentration was 23.2µg/l (StDev=67.2), a level 230 times higher than legally permitted in drinking water. The most concentrated residue measured 586µg/l – almost 6,000 times higher than the maximum concentration of a pesticide allowed in drinking water. The average sum total concentration of pesticides stood at 97.0µg/l (StDev=163.2) – roughly 20 times the legal limit for drinking water.

New pesticides, new residues

Some 55 of the total 148 residues (37.2%) detected relate to five pesticide substances (azoxystrobin, dimethomorph, fenhexamid, fludioxonil, iprovalicarb) not used in European vineyards prior to 1993. These pesticides include iprovalicarb – a likely carcinogen – which was detected in nine bottles of wine.

An additional 44 residues (29.7%) relate to classes of fungicide whose use in grape production has escalated substantially over the same period. They include pyrimethanil, a possible carcinogen which was detected in 25 bottles of wine. The widespread presence of newly adopted and increasingly common pesticides as contaminants in wine suggests that changing use patterns are reflected in the profile of residues detected.

Organic wines

Of the six bottles of organic wine tested, five were shown to contain no pesticide residues. Two of these wines were produced in France, while the other three were Austrian. The identification of five bottles of wine containing no pesticide residues provides a clear proof of principle that the production of pesticide-free wine is possible where grapes are grown under organic farming protocols.

One bottle of organic wine produced in Burgundy, France contained 7.6µg/l of pyrimethanil, a possible carcinogen. This result is most likely due to the drift of pesticides from neighbouring vineyards. While the contamination of organic wines is rare, a 2004 study published by Forschungsinstitut für biologischen Landbau (FiBL), the world's leading organic research foundation, found that small organic wine producers located in areas of intensive conventional production may occasionally suffer contamination in this way[10].

Pesticides in the EU Food Chain

In October 2007, the European Commission published its most recent annual survey of food items sold in the EU[11]. Over 62,000 food samples had been analysed for the presence of pesticides. The results showed comprehensive contamination of the European food chain.

In total 349 different pesticides were detected, while 41.0% of food items were shown to contain pesticides. An addition 4.7% of food samples – almost one item in 20 – contained pesticides at concentrations in excess of legal limits. Over 5% of fruits, vegetables and cereals contained five or more different pesticides. The most contaminated contained 23 pesticide residues.

The presence of high levels of pesticide residues in the European food chain is the direct result of reliance on pesticides in conventional agriculture. Every year over 220,000 tons of pesticides are released into the European environment: most are directly applied to food produce growing in the fields[12]. Annual EU pesticide use includes 108,000 tonnes of fungicide, 84,000 tonnes of herbicide, 21,000 tonnes of insecticide and 7,000 tonnes of growth regulators, amounting to roughly half a kilo of active substances for every man, woman and child resident within the EU.

Conclusions

The results presented in this report suggest that hazardous pesticides are commonplace among samples of conventional wine. They provide further evidence of the widespread contamination of food products sold in the EU, and demonstrate the potential for pesticides to be transferred into processed foods and to endure long after their initial application to food crops.

The abundance of hazardous pesticides in food products sold in the EU underlines the importance of proposals published by the European Commission in 2006 which would lead to the withdrawal of carcinogenic, mutagenic, reprotoxic and endocrine disrupting pesticides from use in food production. These measures should be strengthened, augmented and passed into law.

Food retailers and producers must also play a role in reducing dietary exposure to hazardous pesticides. Supermarkets should work with farmers in reducing and eliminating the application of hazardous pesticides foods grown in the EU as well as internationally.

References

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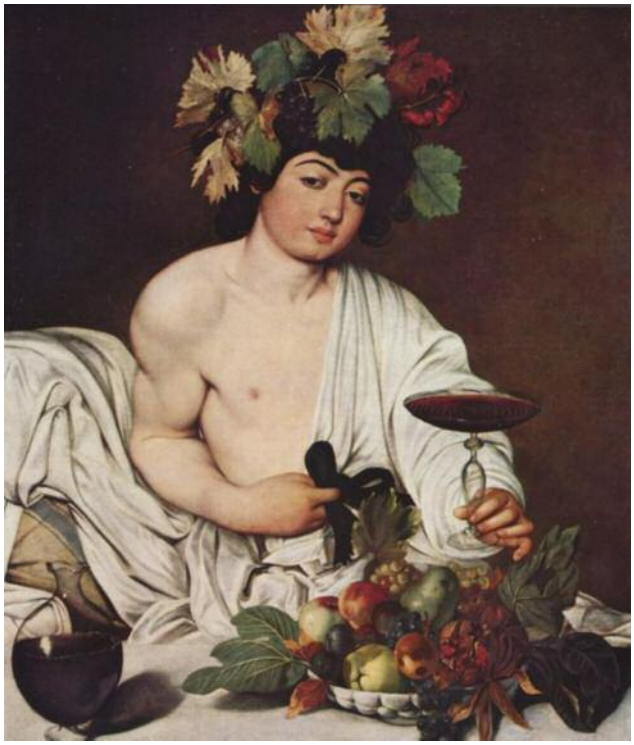

Photo credits

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woman drinking - Hans Voorn
Page 8: wine bottles - tatlin
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Bacchus, the Roman god of wine
by Michelangelo Merisi da Caravaggio

Annex: Full Results

Results of pesticide analysis of 40 bottles of wine bought in the EU

This analysis of wine samples purchased in the European Union was coordinated and published by PAN Europe. Wine testing in Germany was conducted by Greenpeace Germany; in Austria by Global 2000 (Friends of the Earth Austria); and in France by MDRGF (Mouvement pour le Droit et le Respect des Générations Futures). While the results of this study provide substantial evidence of the contamination of European wines samples, they should not be taken as providing a comprehensive assessment.

French Wines: CONVENTIONAL

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Bourgogne(Auxey Duresses)	dimethomorph: 55µg/l					
	pyrimethanil: 1.5 µg/l	Possible[6]				
	cyprodinil: < 1 µg/l					
	procymidone: < 1 µg/l	Yes[1]	Yes[3]	Yes[4]		
	tebuconazole: (trace)	Possible[6]				III[8]
Bourgogne (Santenay Premier Cru)	pyrimethanil: 29.4 µg/l	Possible[6]				
	iprodione: 10.1 µg/l	Yes[1]				
	dimethomorph: 7 µg/l					
	carbendazim: 3.6 µg/l		Yes[2, 3]			
	fludioxonil: 2.2 µg/l					
	cyprodinil: < 1 µg/l					
	procymidone: < 1 µg/l	Yes[1]	Yes[3]	Yes[4]		
	bromopropylate: < 1 µg/l					
	tetradifon: (trace)					
Bourgogne (Mercurey Premier Cru)	dimethomorph: 17 µg/l					
	pyrimethanil: 1.3 µg/l	Possible[6]				
	cyprodinil: < 1 µg/l					
Bordeaux (Pessac-Léognan Cru Classé)	procymidone: 8.6 µg/l	Yes[1]	Yes[3]	Yes[4]		
	cyprodinil: 6.8 µg/l					
	fludioxonil: 1.3 µg/l					
Bordeaux (Saint Estèphe Cru Classé)	pyrimethanil: 233.8 µg/l	Possible6				
	procymidone: 69.1 µg/l	Yes[1]	Yes[3]	Yes[4]		
	azoxystrobin: 13.2 µg/l					
	dimethomorph: 13.1 µg/l					
	procymidone: 5.8 µg/l	Yes[1]	Yes[3]	Yes[4]		
	pyrimethanil: 2 µg/l	Possible[6]				
	fenhexamid: (trace)					

French Wines: CONVENTIONAL continued

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Bordeaux(Pessac-LéognanCru Classé)	azoxystrobin: 13.2 µg/l					
	dimethomorph: 13.1 µg/l					
	procymidone: 5.8 µg/l	Yes[1]	Yes[3]	Yes[4]		
	pyrimethanil: 2 µg/l	Possible[6]				
	fenhexamid: (trace)					
Bordeaux(Pomerol)	pyrimethanil: 14.2 µg/l	Possible[6]				
	azoxystrobin: 3.1 µg/l					
	dimethomorph: 2.9 µg/l					
	cyprodinil: < 1 µg/l					
	procymidone: < 1 µg/l	Yes[1]	Yes[3]	Yes[4]		
	carbendazim: < 1 µg/l		Yes[2, 3]			
	fenhexamid: (trace)					
	tebufenpyrad: (trace)					III[8]
Bordeaux (Lalande de Pomerol)	pyrimethanil: 160 µg/l	Possible[6]				
	iprodione: 20 µg/l	Yes[1]				
	procymidone: 15 µg/l	Yes[1]	Yes[3]	Yes[4]		
Bordeaux(Pomerol)	procymidone: 12 µg/l	Yes[1]	Yes[3]	Yes[4]		
	pyrimethanil: 7 µg/l	Possible6				
Bordeaux(Pessac Léognan)	iprodione: 140 µg/l	Yes[1]				
	procymidone: 110 µg/l	Yes[1]	Yes[3]	Yes[4]		
	pyrimethanil: 17 µg/l	Possible[6]				

KEY

1) Classified as a carcinogen under the EU Directive on Dangerous Substances
2) Classified as a mutagen under the EU Directive on Dangerous Substances
3) Classified as a reprotoxin under the EU Directive on Dangerous Substances
4) Classified as an endocrine disruptor (category 1) under EU COM(1999)706
5) Listed as a 'likely' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
6) Listed as a 'possible' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
7) Listed as Class II under the World Health Organisation classification of pesticides by hazard
8) Listed as Class III under the World Health Organisation classification of pesticides by hazard
9) A cholinesterase inhibitor

Austrian Wines: CONVENTIONAL

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Niederösterreich (Blauer Portugieser)	pyrimethanil: 48 µg/kg	Possible[6]				
	cyprodinil: 15 µg/kg					
	iprovalicarb: 12 µg/kg	Likely[5]				
	fludioxonil: 7 µg/kg					
Vienna (Weisburgunder Seidenhaus)	fludioxonil: 9 µg/kg					
	cyprodinil: 8 µg/kg					
Niederösterreich (Grüner Veltliner DAC Weinviertel)	pyrimethanil: 4 µg/kg	Possible[6]				
Niederösterreich (Gelber Muskateller)	pyrimethanil: 32 µg/kg	Possible[6]				
	iprovalicarb: 15 µg/kg	Likely[5]				
	cyprodinil: 2 µg/kg					
Styria(Sauvignon blanc Edition Römerstein)	pyrimethanil: 6 µg/kg	Possible[6]				
	fludioxonil: 5 µg/kg					
	cyprodinil: 4 µg/kg					
Niederösterreich (Federspiel Riesling)	iprovalicarb: 34 µg/kg	Likely[5]				
	pyrimethanil: 15 µg/kg	Possible[6]				
	fludioxonil: 7 µg/kg					
	dimethomorph: 4 µg/kg					
Burgenland (Terra Austria Cuvee Barique)	pyrimethanil: 23 µg/kg	Possible[6]				
	cyprodinil: 7 µg/kg					
	fludioxonil: 5 µg/kg					

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2) Classified as a mutagen under the EU Directive on Dangerous Substances
3) Classified as a reprotoxin under the EU Directive on Dangerous Substances
4) Classified as an endocrine disruptor (category 1) under EU COM(1999)706
5) Listed as a 'likely' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
6) Listed as a 'possible' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
7) Listed as Class II under the World Health Organisation classification of pesticides by hazard
8) Listed as Class III under the World Health Organisation classification of pesticides by hazard
9) A cholinesterase inhibitor

German Wines: CONVENTIONAL

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Rheinhessen(Beeren-auslese Prädikats-wein)	fenhexamid: 26 µg/kg					
	pyrimethanil: 7.8 µg/kg	Possible[6]				
	dimethomorph: 2.8 µg/kg					
	boscalid: 2 µg/kg					
Württemberg (Trollinger Qualitätswein)	iprovalicarb: 12 µg/kg	Likely[5]				
	boscalid: 10 µg/kg					
	dimethomorph: 5 µg/kg					
	fenhexamid: 3.6 µg/kg					
	tebufenozide: 4.3 µg/kg					
	pyrimethanil: 2.5 µg/kg	Possible[6]				
	cyprodinil: 2.4 µg/kg					
Baden (Spätburg-under Qualitäts-wein)	iprovalicarb: 60 µg/kg	Likely[5]				
	boscalid: 21 µg/kg					
	dimethomorph: 16 µg/kg					
	methoxyfenozide: 13 µg/kg					
	cyprodinil: 10 µg/kg					
	pyrimethanil: 8.2 µg/kg	Possible[6]				
	fludioxonil: 7.4 µg/kg					
	fenhexamid: 5.7 µg/kg					
	tebufenozide: 4.1 µg/kg					
	metalaxyl: 4 µg/kg					III[8]
Mosel, Saar, Ruwer (Riesling Qualitätswein feinherb)	fenhexamid: 22 µg/kg					
	dimethomorph: 2 µg/kg					
Moselland (Riesling)	iprovalicarb: 31 µg/kg	Likely[5]				
	fenhexamid: 18 µg/kg					
	boscalid: 14 µg/kg					
	pyrimethanil: 11 µg/kg	Possible[6]				
	dimethomorph: 9.4 µg/kg					
	metalaxyl: 3.2 µg/kg					III[8]
	azoxystrobin: 2 µg/kg					
	methoxyfenozide: 2 µg/kg					
Saale Unstrut (Dornfelder Qualitätswein b.A.)	fenhexamid: 450 µg/kg					
	pyrimethanil: 190 µg/kg	Possible[6]				
	dimethomorph: 89 µg/kg					
	fenarimol: 5.1 µg/kg		Yes[3]	Yes[4]		
	spiroxamine: 3.7 µg/kg					II[7]
	tebuconazole: 3.2 µg/kg	Possible[6]				III[8]

German Wines: CONVENTIONAL continued

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Pfalz (Silvaner Qualitätswein)	tebuconazole: 17 µg/kg	Possible[6]				III[8]
	dimethomorph: 11 µg/kg					
	boscalid: 11 µg/kg					
	azoxystrobin: 7.2 µg/kg					
	pyrimethanil: 3.5 µg/kg	Possible[6]				
Rheinhessen (Wormser	fenhexamid: 5.5 µg/kg					
Pfalz (Müller Thurgau Qualitätswein)	fenhexamid: 16 µg/kg					
	iprovalicarb: 12 µg/kg	Likely[5]				
	boscalid: 10 µg/kg					
	pyrimethanil: 7.4 µg/kg	Possible[6]				
	tebufenozide: 5.6 µg/kg					
	dimethomorph: 4.6 µg/kg					
	azoxystrobin: 3.9 µg/kg					
	metalaxyl: 2.9 µg/kg					III[8]
Rheinhessen (Portugieser Weißherbst Qualitätswein)	fenhexamid: 19 µg/kg					
	iprovalicarb: 18 µg/kg	Likely[5]				
	boscalid: 15 µg/kg					
	dimethomorph: 5.9 µg/kg					

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6) Listed as a 'possible' carcinogen under the US EPA (Pesticide Programs) Carcinogen List
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9) A cholinesterase inhibitor

Other Wines: CONVENTIONAL

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Italy: Latium (IGT Lazio)	dimethomorph: 2.7 µg/l					
	pyrimethanil: 1.9 µg/l	Possible[6]				
	cyprodinil: 1.4 µg/l					
	azoxystrobin: 1.2 µg/l					
	benalaxyl: < 1 µg/l					
	procymidone: < 1µg/l	Yes[1]	Yes[3]	Yes[4]		
Italy: Sicily (IGT Sicilia)	cyprodinil: 1.9 µg/l					
Italy: Piedmont (DOC Langhe)	cyprodinil: 11.6 µg/l					
	pyrimethanil: 10.5 µg/l	Possible[6]				
	fludioxonil: 7.2 µg/l					
	dimethomorph: 1.4 µg/l					
	benalaxyl: 1.3 µg/l					
	fenitrothion: < 1 µg/l				Yes[9]	II[7]
	procymidone: < 1 µg/l	Yes[1]	Yes[3]	Yes[4]		
	iprovalicarb: < 1 µg/l	Likely[5]				
Portugal (DOC Douro)	iprodione: 8.4 µg/l	Yes[1]				
	cyprodinil: < 1 µg/l					
	penconazole: (trace)					
South Africa (Stellenbosch)	dimethomorph: 24.6 µg/l					
	flusilazole: (trace)	Yes[1]	Yes[3]			II[7]
Australia (Branded wine)	iprodione: 18.4 µg/l	Yes[1]				
	carbendazim: 18 µg/l		Yes[2, 3]			
	pyrimethanil: 3.2 µg/l	Possible[6]				
	cyprodinil: < 1 µg/l					
Chile (Branded wine)	iprodione: 586 µg/l	Yes[1]				
	fludioxonil: 4.3 µg/l					
	cyprodinil: < 1 µg/l					
	tebuconazole: (trace)	Possible6				III[8]
	flusilazole: (trace)	Yes[1]	Yes[3]			II[7]
	fenhexamid: (trace)					

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8) Listed as Class III under the World Health Organisation classification of pesticides by hazard
9) A cholinesterase inhibitor

France & Austria: ORGANIC

Description	Pesticides Identified	Carcinogen	Developmental or Reproductive Toxin	Endocrine Disruptor	Neurotoxin	WHO Hazard Class
Bordeaux (Côtes de Bourg)	(no residues)					
Bourgogne	pyrimethanil: 7.6 µg/l	Possible[6]				
Bordeaux(Pomerol)	(no residues)					
Burgenland (Zweigelt)	(no residues)					
Niederösterreich (Gruener Veltliner)	(no residues)					
Niederösterreich (Welschriesling)	(no residues)					

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9) A cholinesterase inhibitor

Pesticide
Action
Network
Europe
Development House
56-64 Leonard Street
London EC2A 4LT
www.pan-europe.info