

PESTICIDE USAGE IN SCOTLAND

***HARDY NURSERY
STOCK 2005***

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This report presents information obtained from a survey of pesticide usage on hardy nursery stock crops in Scotland, covering the 12 month period from October 2004 to September 2005. Data were collected from 29 holdings, representing 45% of the total area of hardy nursery crops grown in Scotland. The data have been raised to give estimates of national pesticide usage.

Compared with the previous survey in 2001, the total area of hardy nursery crops had increased by 11% to 423 hectares.

Overall usage of pesticides, as measured by the area treated with active ingredients, decreased by 28%, compared with 2001.

Overall insecticide usage increased, the area treated with active ingredients rose by 83% compared with the previous survey. Pyrethroid and carbamate insecticide use increased markedly although there was a considerable reduction in organophosphate formulation use. Primidicarb was the most commonly used insecticide.

Fungicide usage decreased, particularly when measured by weight applied which showed a reduction of 75%. Chlorothalonil was the main fungicide used.

The area treated with herbicides halved compared with data recorded in 2001. Glyphosate was again the most commonly applied active ingredient.

● **INTRODUCTION**

This was the sixth survey of pesticide usage on hardy nursery stock crops. The previous five were conducted in 1976, 1981, 1993, 1997 and 2001¹⁻⁵. The crops surveyed included fruit stocks, ornamental trees, shrubs and other hardy nursery stock comprising herbaceous plants and heathers.

● **DEFINITIONS AND NOTES**

This survey covers only outdoor hardy nursery stock; nursery crops grown under protection are included in the protected crops survey.

Basic area is the planted area of crop that was treated with a given pesticide, irrespective of the number of times it was applied to that area. Basic areas are not presented in the report, but are used to calculate the percentage of crop treated with a given pesticide or pesticide group.

Area treated (or treated hectares) is the basic area of a crop treated with a given pesticide multiplied by the number of treatments that area received.

A proportion of the crops surveyed were grown in containers. It was not possible to calculate the percentage of container grown crops treated with individual pesticides or pesticide groups as the continuous throughput of plants does not allow accurate estimation of these data. Therefore, in this report, where percentages of the crop treated with individual pesticides or pesticide groups are reported, they refer solely to field-grown crops.

During this survey, insufficient roses were surveyed to allow the data to be raised and included in this report. Only 11.7 hectares of roses were recorded in the census, of which 0.01 hectares were surveyed. Therefore it has not been possible to include this category for this survey.

The reasons for pesticide use reported in the text are those given by growers and sometimes may be inappropriate.

In this report, the term 'formulation(s)' is used to denote the pesticide active ingredient or mixture of active ingredients in a product(s).

Due to rounding, there may be slight differences in totals both within and between tables.

Data from the 2001 survey are provided for comparison purposes in some of the tables. When comparing the data the reader should be aware that there may be differences in the range of crops surveyed, and in the areas of each of the crops grown, between surveys.

Using the 2005 Agricultural Census⁶, a sample was selected representing the whole of Scotland from holdings growing hardy nursery stock crops.

The country was divided into 11 land-use regions (Fig 1⁷). Holdings were grouped by land-use region and stratified by size group (based on the total area of hardy nursery stock crops grown on the holding).

Information on pesticide usage was collected by personal interview. The survey period was the 12 months from October 2004 to September 2005. Total areas of crops surveyed, together with the number of holdings visited are presented in Table 2. A more detailed breakdown involving the land-use regions and size-groups cannot be published in this report as, in some instances, fewer than 5 holdings are involved.

For all crops, except for roses and rose stocks, sample data were raised to give estimates of national pesticide usage using raising factors. These were based on the areas of hardy nursery crops in the 2005 Agricultural Census⁶ within regions and size groups. Land-use regions Highlands & Islands, Caithness & Orkney, Moray Firth and Aberdeen were amalgamated (Northern Scotland), as were regions Angus and East Fife (East Central), and regions Lothian, Tweed Valley, Southern Uplands and Solway (West Central and South Scotland). Adjustments were made for each crop within each region by applying the raising factors to the sample area of each crop grown and comparing this with the area from the 2001 Agricultural Census. A second adjustment was made for crops where no holdings were sampled in one or more regions. In order to prevent disclosure of information about individual holdings where there are fewer than 5 in any sampling unit, raising factors are not published in this report.

FRUIT STOCKS

The area of fruit stocks cultivated was 53.7 hectares in 2005, a 64% increase from the previous survey. The majority of the fruit stocks surveyed were raspberry spawn; small areas of top fruits were also recorded. All surveyed fruit stocks were field grown.

● *Insecticides/acaricides (Tables 4 & 7)*

Sixty-four percent of surveyed fruit stocks were treated with an insecticide compared with 74% in 2001. All insecticides were reported to have been applied to control aphids.

As in 2001, pirimicarb was the most commonly used insecticide and was applied to 117 hectares of fruit stocks, 53% of the crop. In addition, Lambda-cyhalothrin was applied to 87 hectares, dimethoate to 11 hectares and deltamethrin to 5 hectares. These insecticides had not been reported on fruit stocks in the previous survey.

● *Fungicides (Tables 5 & 8)*

The proportion of the crop treated with fungicide was 48% compared to 74% of the crop in 2001. Tolyfluanid was the most commonly used fungicide, applied to 85 hectares (41%) of fruit stocks for control of *Botrytis*. Bupirimate and fenarimol were applied for mildew control to 15 and 30 hectares respectively and fluazinam was applied to 11 hectares for general disease control.

Dichlofluanid and triadimefon, the most commonly applied fungicides in 2001, were not recorded in this survey having lost registration approval under the EU review process.

● *Herbicides (Tables 6 & 9)*

Ninety-three percent of the crop area was treated with herbicide, a similar percentage to that recorded in previous surveys. Isoxaben, napropamide and the mixed formulation containing diquat/paraquat, were widely used for general weed control (applied to 24, 41 and 31 ha respectively).

The principal herbicide used in 2001, bromacil, which was applied to 99% of the crop, was not recorded in this survey as registration approval was withdrawn following no support for this 3rd round active ingredient (Commission Regulation (EC) 2076/2002).

The census area of shrubs grown in 2005 was 43.5 hectares, compared to the 53 hectares reported in 2001. As in the previous report, the majority of the crop (71%) was container-grown.

● ***Insecticides/acaricides and molluscicides (Tables 4 & 7)***

Insecticides were only applied to container grown shrubs, of which a total of 16 hectares were treated.

Pymetrozine, applied to 11 hectares for aphid control, was the most widely used insecticide. Small areas were also treated with imidacloprid and fipronil for vine weevil control and with bifenthrin for aphid control.

Metaldehyde was applied to 5 hectares of field and container grown shrubs for slug control.

● ***Fungicides (Tables 5 & 8)***

The total spray area treated with fungicide active ingredients was 93 hectares. As with insecticidal treatments, fungicides were only applied to container grown shrubs.

As in the previous survey, the most commonly used fungicide was chlorothalonil, applied to 45 hectares, predominately for disease precaution but also for liverwort control. Fosetyl-aluminium, azoxystrobin and penconazole were applied for general disease precaution to 34, 11 and 3 hectares of shrubs respectively.

● ***Herbicides and growth regulators (Tables 6 & 9)***

The total area treated with herbicide active ingredients was 52 hectares, considerably less than the 137 hectares recorded in 2001. All herbicides used were applied for general weed control.

Oxadiazon was the most commonly used herbicide recorded, applied to 22 hectares, followed by isoxaban, dichlobenil and glyphosate applied to 11, 8 and 7 hectares respectively.

A growth regulator, 1-naphthylacetic acid, was applied to a very small area (<0.05 ha) of container grown shrubs.

Ornamental trees remain the main category of hardy nursery crops in Scotland. The area grown in 2005 was 209 hectares. It was estimated that 94% of the crop was field grown.

● ***Insecticides/acaricides and molluscicides (Tables 4 & 7)***

The proportion of the field crop receiving insecticides was 54%. Aphid control was the most commonly provided reason for insecticide use.

Pirimicarb was the most commonly applied insecticide, with 173 hectares treated with this active ingredient for aphid control. Deltamethrin and thiacloprid were both applied to 49 hectares for aphid and caterpillar control respectively.

Clofentezine was applied to 8 hectares for conifer spinning mite and bifenthrin was applied to a very small area (<0.5 ha) as part of an insecticide/fungicide mix. Chlorpyrifos, the most commonly used insecticide used on ornamental trees in 2001, was not recorded in this survey.

Metaldehyde was applied to 2 hectares of container-grown crops for slug control. This is a large reduction in molluscicide use from 2001 when 26 hectares of container crops were treated.

● ***Fungicides (Tables 5 & 8)***

The proportion of field crops treated with fungicide was 9%. The majority of fungicide sprays were made for general disease precaution, with a small number of sprays applied for mildew control.

The most commonly used fungicides were chlorothalonil and fosetyl-aluminium, applied to 99 and 84 hectares of ornamental trees respectively.

Sulphur, applied to 219 hectares in 2001 was not recorded in this survey.

● ***Herbicides (Tables 6 & 9)***

Fifty-four percent of field-grown ornamental trees were treated with herbicide. All herbicides were reported to have been applied for general weed control.

As in previous surveys, glyphosate was the most commonly used herbicide, and was applied to 130 hectares, 47% of the field grown crop. Oxadiazon, atrazine, isoxaben and paraquat were applied to 46, 35, 25 and 14 hectares of the crop respectively.

The area of this category comprising herbaceous plants and heathers was 105.7 hectares, more than double the 42.9 hectares recorded in the 2001 census. Ninety-eight percent of the crop surveyed was grown in containers.

● ***Insecticides/acaricides and molluscicides (Tables 4 & 7)***

A total of 67 hectares was treated with insecticides, all applied to the container grown stock.

The most commonly applied insecticide was imidacloprid, which was applied to 57 hectares for vine weevil control. Small areas were treated with diflubenzuron (8 ha) for caterpillars and with fipronil (1 ha) and pymetrozine (1 ha) for vine weevil and aphids respectively.

Chlorpyrifos, the most commonly applied insecticide in the previous survey, was not recorded in 2005.

Metaldehyde was applied to 24 hectares of the container grown crop for slug control.

● ***Fungicides (Tables 5 & 8)***

A total of 179 hectares was treated with fungicides, predominately for general disease control but also for control of mildew and liverwort. As in the 2001 survey, chlorothalonil was the most commonly applied fungicide, with 89 hectares treated. Other fungicides recorded were penconazole, fosetyl-aluminium and iprodione applied to 57, 26 and 8 hectares respectively.

● ***Herbicides (Tables 6 & 9)***

A total of 65 hectares was treated with herbicides, all reported to have been used for general weed control. As in 2001, oxadiazon was the principal herbicide used, applied to 29 hectares. Glyphosate and dichlobenil, were each applied to 18 hectares. Paraquat, which was reported to have been widely used in the 2001 survey, was only applied to 1 hectare.

COMPARISON WITH PREVIOUS SURVEYS

The total area of hardy nursery stock grown in 2005 was 423 hectares, an 11% increase from the previous survey. Areas of fruit stocks and other hardy nursery stock displayed increases of 64 and 146% respectively. The area of ornamental trees and shrubs cultivated was similar to the previous survey, whilst rose stock area declined by 73%.

Comparisons in pesticide use by weight and spray hectares of active ingredients and formulations applied in the current and previous two surveys are presented in Table 15.

Despite the increase in crop area, the estimated total spray area of all pesticide active ingredients was 28% less than that reported in the previous survey and the weight of pesticides applied was 64% less. This decrease in pesticide application is predominantly due to reduced herbicide and fungicide usage.

The area of crops treated with herbicides decreased by 48% compared with the 2001 survey, with an associated weight decrease of 15%. However, although application of herbicides decreased, the active ingredients applied were similar to previous surveys, with glyphosate being most commonly applied herbicide.

The area treated with fungicides decreased by 41% from that reported in 2001 and the application weight decreased by 75%. Both decreases were primarily due to the fact that sulphur, which is applied at very high dose rates, was the main fungicide in the 2001 survey but was not encountered in the current survey. Chlorothalonil was the most commonly used fungicide, its use increasing markedly from the previous survey with a four-fold increase in treated area.

The area treated with insecticide active ingredients was 83% greater than in the previous survey. However, the weight of insecticides applied decreased by 49%. The increase in treated area was predominately due to greater use of pyrethroid insecticides, which showed a six-fold increase from the 2001 survey. In addition, the area of organophosphate insecticides applied decreased by 95%. As pyrethroids are applied at considerably lower dose rates than organophosphates this accounts for the reduction in the weight of pesticides applied. In comparison with the previous survey, pirimicarb and imidacloprid were more widely used, with a six-fold and eight-fold increase in treated areas respectively. The most commonly used active ingredient in this survey was pirimicarb, a carbamate. In the previous survey the organophosphate insecticide chlorpyrifos was the most extensively used. Chlorpyrifos was not recorded in this survey. As in the previous survey, no organochlorine insecticides were recorded.

There was a decrease in molluscicide usage from the last survey of 53% by treated area and 23% by application weight.

Overall, fungicide and herbicide usage on hardy nursery stock was considerably less than recorded in the previous survey. In contrast, the area treated with insecticides increased and the range and volumes of insecticides and insecticide groups applied also showed marked differences from the previous survey. It should be noted that usage recorded in the 2001 survey was considerably greater than reported in 1997 and overall usage levels in this survey are very similar to those reported in 1997.

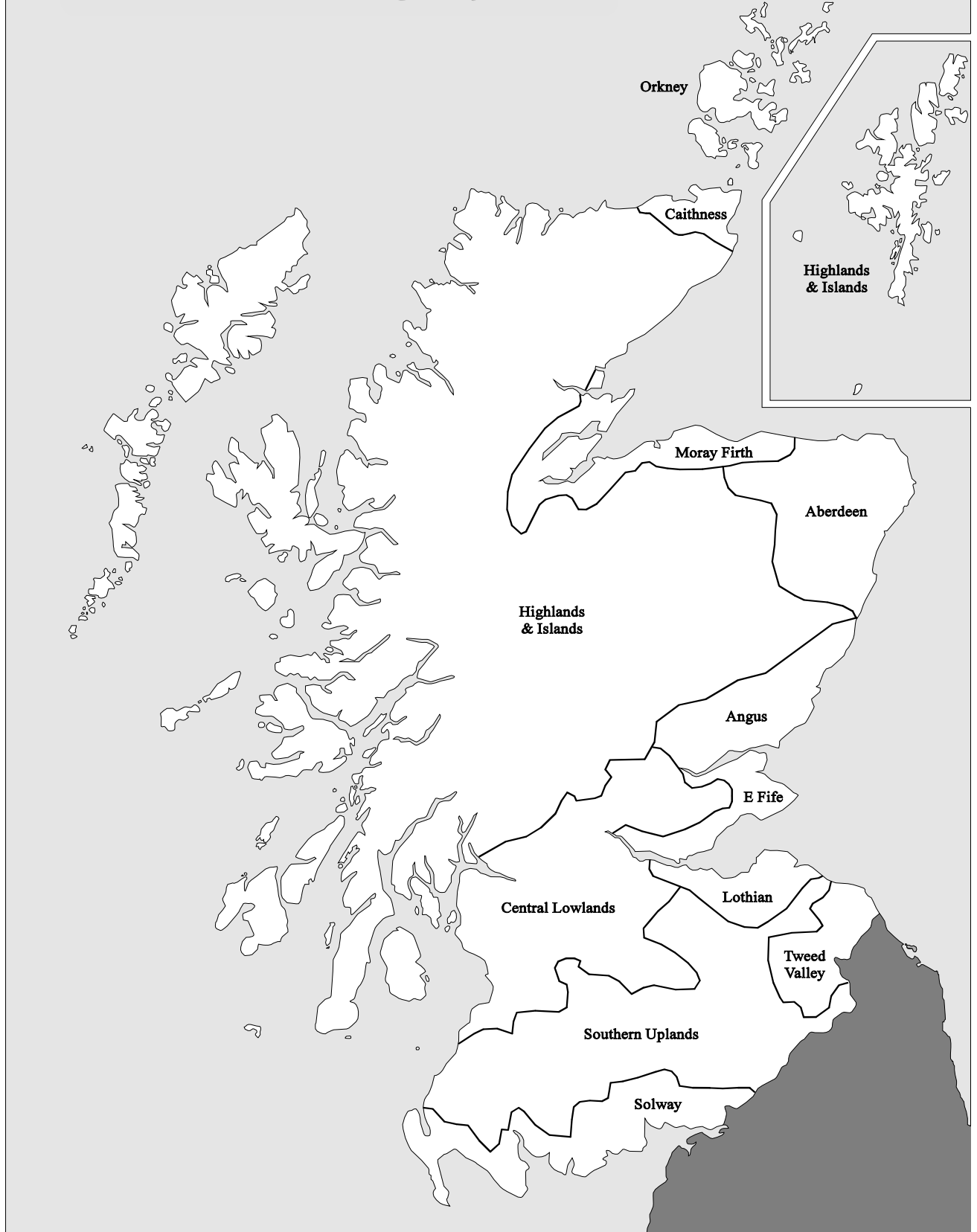
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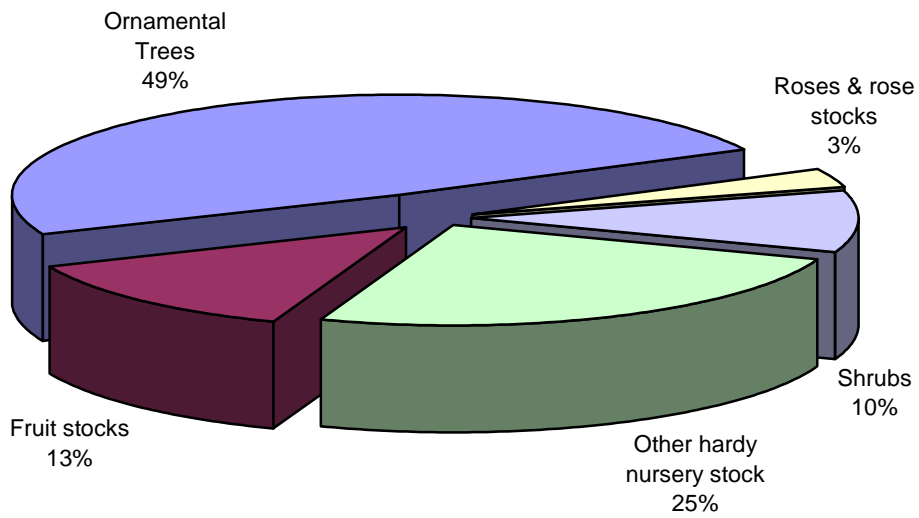
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● **FIGURE 1** *Land-Use Regions of Scotland*



● *Figure 2 Hardy nursery stock crop areas in 2005*



● *Figure 3 Percentage of field crop areas treated with pesticides*

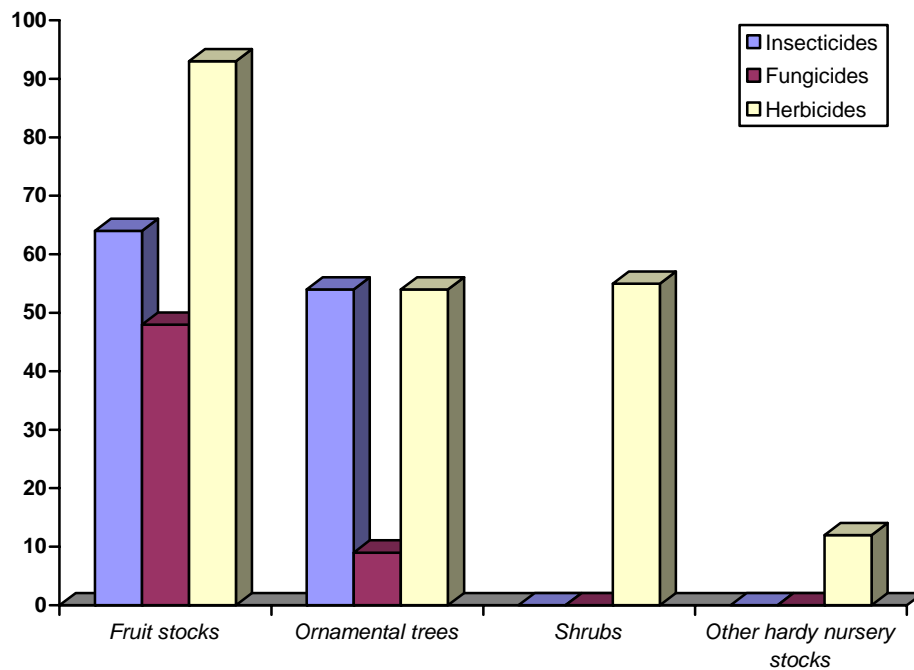


TABLE 1 Regional distribution of hardy nursery stock crops in 2005

	<i>North (ha)</i>	<i>East Central (ha)</i>	<i>West central (ha)</i>	<i>South (ha)</i>	<i>Scotland (ha)</i>	<i>Scotland 2001 (ha)</i>	<i>% change</i>
Fruit stocks	28.7	21.5	*	0.4	53.7	32.8	64
Ornamental trees	30.2	136.9	9.0	32.5	208.7	209.5	0
Roses and rose stocks	1.4	*	*	0.2	11.7	43.2	-73
Shrubs	13.4	3.2	15.6	11.3	43.5	52.6	-17
Other hardy nursery stock	62.7	7.9	10.7	24.4	105.7	42.9	146
All hardy nursery stock	136.3	179.4	38.7	68.8	423.2	381.1	11

* To prevent disclosure of information about individual holdings, entries relating to fewer than 5 holdings have not been published

TABLE 2 Areas of crops and numbers of holdings surveyed

	<i>Sampled area (ha)</i>	<i>Census area (ha)</i>
Fruit stocks	36.5	53.7
Ornamental trees	128.4	208.7
Roses and rose stocks	0.01	11.7
Shrubs	16.3	43.5
Other hardy nursery stock	7.9	105.7
All hardy nursery stock	189.1	423.2
Number of holdings	29	177

● **TABLE 3** *Percentage of each field crop treated with pesticides*

	<i>Fruit stocks</i>	<i>Ornamental trees</i>	<i>Shrubs</i>	<i>Other hardy nursery stock</i>
Fungicides	48	9		
Herbicides	93	54	55	12
Insecticides	64	54		
Molluscicides			1	
<i>Any pesticide</i>	93	89	56	12

These data are refer only to field grown crops, container grown crops are not included

TABLE 4 Insecticide/acaricide and molluscicide formulations

Spray area (ha) of treated field and container crops and percentage area of treated field crops

<i>Insecticides</i>	<i>Fruit stocks</i>		<i>Ornamental trees</i>		<i>Shrubs</i>		<i>Other hardy nursery stock</i>		<i>All crops</i>	<i>2001</i>
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
Bifenthrin**					+	++			+	2
Clofentezine			8	*					8	
Deltamethrin	5	9	49	9					54	
Diflubenzuron							8	++	8	
Dimethoate	11	11							11	86
Fipronil			1	++	2	++	1	++	4	
Imidacloprid					3	++	57	++	60	12
Lambda-cyhalothrin	87	25							87	
Pirimicarb	117	53	173	45					290	77
Pymetrozine					11	++	1	++	12	
Thiacloprid			49	9					49	
All insecticides	221	64	281	54	16	++	67	++	584	316
<i>Molluscicides</i>										
Metaldehyde			2	++	5	1	24	++	32	22
All molluscicides			2	++	5	1	24	++	32	68
Area planted (ha)	54		209		43		106		412	381

‘+’ = < 0.5 ha

‘++’ = not recorded on field-grown crops

‘*’ = < 0.5 %

‘***’ = please also refer to mixed formulations containing bifenthrin presented in Table 5

● **TABLE 5 Fungicide and mixed formulations**

Spray area (ha) of treated field and container crops and percentage area of treated field crops

<i>Fungicides</i>	<i>Fruit stocks</i>		<i>Ornamental trees</i>		<i>Shrubs</i>		<i>Other hardy nursery stock</i>		<i>All crops</i>	<i>2001</i>
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
Azoxystrobin					11	++			11	
Bupirimate	15	28							15	34
Chlorothalonil			99	9	45	++	89	++	233	55
Fenarimol	30	28							30	73
Fluazinam	11	20							11	
Fosetyl-aluminium			84	8	34	++	26	++	143	12
Iprodione							8	++	8	7
Mancozeb/Metalaxyl-M			+	++					+	
Penconazole					3	++	57	++	60	
Tolyfluanid	85	41							85	
All fungicides	141	48	183	9	93	++	179	++	596	891
Mixed formulations										
Bifenthrin/myclobutanil			+	++			+	++	+	
All mixed formulations			+	++			+	++	+	1
Area planted (ha)	54		209		43		106		412	381

‘+’ = < 0.5 ha

‘++’ = not recorded on field-grown crops

TABLE 6 Herbicide and growth regulator formulations

Spray area (ha) of treated field and container crops and percentage area of treated field crops

Herbicides	Fruit stocks		Ornamental trees		Shrubs		Other hardy nursery stock		All crops	2001
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
Atrazine			35	18					35	44
Dichlobenil			+	++	8	55	18	++	26	8
Diquat/paraquat	31	57							31	81
Fluazifop-P-butyl	2	3							2	8
Glyphosate	2	4	130	47	7	3	18	12	156	336
Isoxaben	24	45	25	9	11	++			60	54
Napropamide	41	76							41	31
Oxadiazon			46	18	22	++	29	++	97	62
Paraquat	19	93	14	7	4	++	1	++	37	98
Pendimethalin	23	42							23	
Simazine	7	12							7	49
All herbicides	148	93	249	54	52	55	65	12	514	954
Growth Regulators										
1-naphthylacetic acid					+	++			+	
All growth regulators					+	++			+	
Area planted (ha)	54		209		43		106		412	381

'+' = < 0.5 ha

'++' = not recorded on field-grown crops

● **TABLE 7 Insecticide/acaricide and molluscicide active ingredients**

Spray area (ha) of treated field and container crops and percentage area of treated field crops

<i>Insecticides</i>	<i>Fruit stocks</i>		<i>Ornamental trees</i>		<i>Shrubs</i>		<i>Other hardy nursery stock</i>		<i>All crops</i>	<i>2001</i>
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
<i>Pyrethroids</i>										
Bifenthrin			+	*	1	++	1	++	1	2
Deltamethrin	5	9	49	9					54	
Lambda-cyhalothrin	87	25							87	
<i>Carbamates</i>										
Pirimicarb	117	53	173	45					290	78
<i>Organophosphates</i>										
Dimethoate	11	11							11	86
<i>Others</i>										
Diflubenzuron							8	++	8	
Clofentezine			8	*					8	
Imidacloprid					3	++	57	++	60	12
Pymetrozine					11	++	1	++	12	
Fipronil			1	++	2	++	1	++	4	
Thiacloprid			49	9					49	
<i>All insecticides</i>	221	64	281	54	16	++	67	++	584	320
<i>Molluscicides</i>										
Metaldehyde			2	++	5	1	24	++	32	22
<i>All molluscicides</i>			2	++	5	1	24	++	32	68
Area planted	54		209		43		106		412	381

'+' = < 0.5 ha '++' = not recorded on field-grown crops '*' = < 0.5 %

TABLE 8 Fungicide active ingredients

Spray area (ha) of treated field and container crops and percentage area of treated field crops

<i>Fungicides</i>	<i>Fruit stocks</i>		<i>Ornamental trees</i>		<i>Shrubs</i>		<i>Other hardy nursery stock</i>		<i>All crops</i>	<i>2001</i>
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
Azoxystrobin					11	++			11	
Bupirimate	15	28							15	153
Chlorothalonil			99	9	45	++	89	++	233	55
Fenarimol	30	28							30	73
Fluazinam	11	20							11	
Fosetyl-aluminium			84	8	34	++	26	++	143	12
Iprodione							8	++	8	8
Mancozeb			+	++					+	4
Myclobutanil			+	++			+	++	+	186
Metalaxyl-M			+	++					+	
Penconazole					3	++	57		60	
Tolyfluanid	85	41							85	
All fungicides	141	48	183	9	93	++	179	++	596	1015
Area planted	54		209		43		106		412	381

'+' = < 0.5 ha

'++' = not recorded on field-grown crops

● **TABLE 9 Herbicide and growth regulator active ingredients**

Spray area (ha) of treated field and container crops and percentage area of treated field crops

<i>Herbicides</i>	<i>Fruit stocks</i>		<i>Ornamental trees</i>		<i>Shrubs</i>		<i>Other hardy nursery stock</i>		<i>All crops</i>	<i>2001</i>
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)
Atrazine			35	18					35	44
Dichlobenil			+	++	8	55	18	++	26	8
Diquat	31	57							31	83
Fluazifop-P-butyl	2	3							2	8
Glyphosate	2	4	130	47	7	3	18	12	156	336
Isoxaben	24	45	25	9	11	++			60	54
Napropamide	41	76							41	31
Oxadiazon			46	18	22	++	29	++	97	62
Paraquat	50	93	14	7	4	++	1	++	68	181
Pendimethalin	23	42							23	
Simazine	7	12							7	50
All herbicides	179	93	249	54	52	55	65	12	545	1046
Growth regulators										
1-naphthylacetic acid					+	++			+	
All growth regulators					+	++			+	
Area planted (ha)	54		209		43		106		412	381

'+' = < 0.5 ha

'++' = not recorded on field-grown crops

● **TABLE 10 Insecticide and molluscicide weights**

Weights (kg) of active ingredients

<i>Insecticides</i>	<i>Fruit stocks</i>	<i>Ornamental trees</i>	<i>Shrubs</i>	<i>Other hardy nursery stock</i>	<i>All crops</i>	<i>2001</i>
<i>Pyrethroids</i>						
Bifenthrin		+	+		+	+
Deltamethrin	+	+			+	
Lambda-cyhalothrin	1				1	
<i>All pyrethroids</i>	1	+	+		1	4
<i>Carbamates</i>						
Pirimicarb	5	23			28	11
<i>All carbamates</i>	5	23			28	11
<i>Organophosphates</i>						
Dimethoate	1				1	29
<i>All organophosphates</i>	1				1	337
<i>Others</i>						
Imidacloprid			8	137	145	10
Pymetrozine			3	+	3	
Fipronil		+	+	+	+	
Thiacloprid		6			6	
Diflubenzuron				1	1	
Clofentezine		2			2	
<i>All others</i>		8	10	138	156	10
<i>All insecticides</i>	6	31	10	138	185	363

Cont...

● **TABLE 10 Insecticide/acaricide and molluscicide weights (continued)**

Weights (kg) of active ingredients

<i>Molluscicides</i>	<i>Fruit stocks</i>	<i>Ornamental trees</i>	<i>Shrubs</i>	<i>Other hardy nursery stock</i>	<i>All crops</i>	<i>2001</i>
Metaldehyde		2	4	12	17	20
<i>All molluscicides</i>		2	4	12	17	22

‘+’ = <0.5 kg

● **TABLE 11 Fungicide weights**

Weights (kg) of active ingredients

<i>Fungicides</i>	<i>Fruit stocks</i>	<i>Ornamental trees</i>	<i>Shrubs</i>	<i>Other hardy nursery stock</i>	<i>All crops</i>	<i>2001</i>
Azoxystrobin			3		3	
Bupirimate	5				5	30
Chlorothalonil		38	22	112	172	76
Fenarimol	1				1	3
Fluazinam	14				14	
Fosetyl-aluminium		168	67	51	287	247
Iprodione				4	4	4
Mancozeb		+			+	5
Metalaxyl-M		+			+	
Myclobutanil			+		+	8
Penconazole			+	1	1	
Tolyfluanid	87				87	
All fungicides	107	207	168	92	574	2335

'+' = <0.5 kg

● **TABLE 12 Herbicides and growth regulator weights**

Weights (kg) of active ingredients

<i>Herbicides</i>	<i>Fruit stocks</i>	<i>Ornamental trees</i>	<i>Shrubs</i>	<i>Other hardy nursery stock</i>	<i>All crops</i>	<i>2001</i>
Atrazine		70			70	38
Dichlobenil		4	67	103	175	15
Diquat	7				7	15
Fluazifop-P-butyl	1				1	2
Glyphosate	2	222	5	4	233	362
Isoxaben	4	6	3		13	12
Napropamide	115				115	55
Oxadiazon		35	59	17	110	98
Paraquat	17	15	5	+	37	96
Pendimethalin	31				31	
Simazine	3				3	41
All herbicides	180	351	139	124	794	936
Growth regulators						
1-naphthylacetic acid			+		+	
All growth regulators			+		+	

'+' = <0.5 kg

● **TABLE 13 Principal active ingredients by area**

Area treated (spray hectares) with the 20 most used active ingredients on all hardy nursery stock crops

		Type*	2005	2001
1	Pirimicarb	I	290	78
2	Chlorothalonil	F	233	55
3	Glyphosate	H	156	336
4	Fosetyl-aluminium	F	143	12
5	Oxadiazon	H	97	62
6	Lambda-cyhalothrin	I	87	
7	Tolyfluanid	F	85	
8	Paraquat	H	68	181
9	Penconazole	F	60	
10	Imidacloprid	I	60	12
11	Isoxaben	H	60	54
12	Deltamethrin	I	54	
13	Thiacloprid	I	49	
14	Napropamide	H	41	31
15	Atrazine	H	35	44
16	Metaldehyde	M	32	22
17	Diquat	H	31	83
18	Fenarimol	F	30	73
19	Dichlobenil	H	26	8
20	Pendimethalin	H	23	

*+ = <0.5 kg

● **TABLE 14 Principal active ingredients by weight**

Quantity (kg) of the 20 most used active ingredients on all hardy nursery stock crops

		Type*	2005	2001
1	Fosetyl-aluminium	F	287	247
2	Glyphosate	H	233	362
3	Dichlobenil	H	175	15
4	Chlorothalonil	F	172	76
5	Imidacloprid	I	145	10
6	Napropamide	H	115	55
7	Oxadiazon	H	110	98
8	Tolyfluanid	F	87	
9	Atrazine	H	70	38
10	Paraquat	H	37	96
11	Pendimethalin	H	31	
12	Pirimicarb	I	28	11
13	Metaldehyde	M	17	20
14	Fluazinam	F	14	
15	Isoxaben	H	13	12
16	Diquat	H	7	15
17	Thiacloprid	I	6	
18	Bupirimate	F	5	30
19	Iprodione	F	4	4
20	Simazine	H	3	41

*+ The different pesticide types are shown (I: Insecticide, M: Molluscicide, F: Fungicide, H: Herbicide)

● **TABLE 15 Comparison with previous surveys**

Pesticide usage in 1997, 2001 and 2005, area treated with formulations and active ingredients (ai) and the quantities applied

	1997			2001			2005		
	Formulations (ha)	A.i. (ha)	Kg	Formulations (ha)	A.i. (ha)	Kg	Formulations (ha)	A.i. (ha)	Kg
<i>Insecticides</i>									
Pyrethroids	171	177	2	20	23	4	142	142	1
Organophosphates	134	140	103	202	204	337	11	11	1
Organochlorines	+	+	+						
Carbamates	12	20	4	77	78	11	290	290	28
Mixed & other insecticides	30	24	5	19	15	10	141	141	156
All insecticides	348	361	115	317	320	363	584	584	185
<i>Molluscicides</i>	2	2	1	68	68	22	32	32	17
Fungicides	286	330	127	891	1015	2335	596	596	574
<i>Mixed insecticides/fungicides</i>	8			1			+		
<i>Herbicides</i>	511	523	665	954	1046	936	514	545	794
<i>Growth regulators</i>				2	2	1	+	+	+
<i>Soil sterilants</i>	1	1	487	2	2	695			
All pesticides	1503	1578	1509	2234	2452	4351	1726	1757	1571
Area planted (ha)	341			381			423		

'+' = <0.5 ha/kg