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PESTICIDE USAGE IN NORTHERN IRELAND

SURVEY REPORT 199

Hardy Nursery Stock Crops

2003

Agriculture, Fishing & Forestry

A National Statistics Publication

PESTICIDE USAGE SURVEY REPORT 199

NORTHERN IRELAND
HARDY NURSERY STOCK CROPS

2003

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Department of Agriculture & Rural Development

ISBN 1 85527 789 1

A NATIONAL STATISTICS PUBLICATION

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The County Regions Of Northern Ireland

SUMMARY

This report presents information from a survey of the pesticide usage practices on hardy nursery stock crops grown in Northern Ireland in 2003.

The total area of hardy nursery stock crops grown was 1,018,358 m^2 (102ha), with an estimated 44% of all hardy nursery stock crops grown in County Down. Field-grown Christmas and native trees accounted for 66% of the area grown. Data collected from 111 growers estimated that 527kg of pesticide active ingredients were applied to 2,292,748 treated m^2 (229 spha).

Herbicides accounted for 47% of the pesticide-treated area, representing 25% of the weight of pesticides applied. Glyphosate was the herbicide active ingredient most frequently used, mainly around field-grown tree areas.

Fungicides, applied to 33% of the total pesticide-treated area, accounted for 69% of the weight of pesticides applied. Carbendazim, mainly used on field-grown cut flowers, was the most frequently used fungicide active ingredient.

Insecticide and acaricides were applied to 17% of the pesticide-treated area, representing only 1% of the total weight of pesticides applied. Bifenthrin was the insecticide/acaricide active ingredient most extensively used, mainly on shrubs.

The only molluscicide recorded was metaldehyde and this active ingredient was applied to less than 1% of both the pesticide-treated area and the quantity of total pesticides used.

Growth regulators were applied to less than 1% of both the total pesticide-treated area and the weight of pesticides used. Paclobutrazol was the only growth regulator recorded.

The biological control agent *Bacillus subtilis* (principally applied when the crops were inside during the propagation and liner stages) was used on 2,710spm^2 of mixed crop areas.

Mixed formulations, containing fungicide/insecticide mixtures and phenolic derivatives, accounted for 2% of the total pesticide-treated area but represented 4% of the total weight of pesticide used.

INTRODUCTION

As a participant in the UK Working Party on Pesticide Usage Surveys, the Department of Agriculture and Rural Development (DARD), conducts a programme of cyclical surveys to examine pesticide usage in all sectors of the agricultural and horticultural industries. The data collected provides information for consideration by the Advisory Committee on Pesticides. The information may also be used by those involved in residue testing, for public information, provision of data for research and evaluation of trends in pesticide usage.

This is the first survey of pesticide usage on hardy nursery stock crops (including field grown Christmas and native trees) in Northern Ireland.

A list of published Northern Ireland Pesticide Usage Survey reports are shown in Appendix 1.

DEFINITIONS AND NOTES

- 'Basic area' refers to the actual planted area of crop, which was treated with a given pesticide.
- 'Treated area' refers to the total area treated with a pesticide, which includes all repeated applications to the basic area.
- 'Spm^2' refers to the treated area in square metres ('Spha' refers to the treated area in hectares). This is an estimated figure throughout the report, as some growers only knew the total spray usage and their holding area, but the sprays may / may not have been applied to whole or part of the area, therefore the area may be an over-estimate on this basis.
- 'Reasons for use'; the reasons reported for the use of pesticides are the growers stated reasons and may sometimes be inappropriate.
- 'Rounding'; due to rounding of figures, there may be slight differences in totals both within and between tables.
- Spot treatments were taken as 25% of the area.

METHODS

The total population of nursery stock growers in Northern Ireland was determined from the Northern Ireland Agricultural Census, June 2003 (Anon., 2004), and a comprehensive list of growers held by DARD advisory staff. A total of 151 growers, representing 65% of the estimated population of general (includes hardy nursery stock and protected ornamental crops) nursery stock growers were sampled. As there was no information to identify which holding had protected or non-protected crops, this was determined following data entry. Of the 151 growers sampled 111 grew hardy nursery stock crops. The sample was stratified into the six county regions of Northern Ireland. The total number of holdings in each county, together with the numbers surveyed are shown in Table 1 (Figure 1). The estimated total area of hardy nursery stock crops grown in Northern Ireland is shown in Table 2.

This survey represents the period from September 2002 to September 2003 inclusive.

The purpose of the survey was explained to selected growers in preliminary correspondence. Holdings were then visited and data collected by personal interview. The collected data were analysed using SPSS software.

RESULTS AND DISCUSSION

REGIONAL PESTICIDE USAGE

Regionally, 44% of the area grown and 40% of the total pesticide treated-area was attributed to County Down, accounting for 32% of the total quantity of pesticides used. County Tyrone accounting for only 4% of the area grown and 12% of the total pesticide-treated area represented 50% of the total quantity of pesticide usage. An estimated 26% of all insecticides and 17% of fungicides were applied to hardy nursery stock crops grown in County Tyrone. A further 26% of the total pesticide-treated area was in County Antrim accounting for 10% of the total quantity of pesticides applied. (Tables 3 & 4, Figure 3).

PESTICIDE USAGE ON CROPS

The estimated quantities of pesticide active ingredients used and the area of crop types treated with pesticides are shown in Table 5 & 6. Hardy nursery stock crops were grouped into the following categories; Shrubs, which had the highest pesticide usage (accounted for 25% of the total pesticide-treated area and 61% of the total quantity of pesticides applied), mixed areas (13% and 10%, respectively), ornamental trees (1% of both the treated area and quantity used), roses (<1% of both the treated area and quantity used), bulbs (4% and 1.5%, respectively), cut flowers (19% and 9% respectively), mixed field crops (7% and 3%, respectively), and trees (accounting for 30% of the treated area and 15% of the quantity of pesticides applied).

TOTAL PESTICIDE USAGE

A total of 527 kilograms of pesticide active ingredients were applied to 2,292,748 spray m^2 (229 spha) of hardy nursery stock crops grown in Northern Ireland in 2003. (Tables 3 and 4, fig.2). Fungicides were applied to 33% of the pesticide-treated area, representing 69% of the weight of pesticides applied. Herbicides were applied to 47% of the area treated with pesticides, accounting for 25% of the total weight of pesticides used.

Insecticides/acaricides, applied to 17% of the pesticide-treated area, represented 1% of the total pesticide usage by weight. Biological controls, molluscicides and growth regulators accounted for less than 1% of both the total pesticide-treated area and weight of active ingredients used, respectively.

Mixed formulations were applied to 2% of the pesticide-treated area and accounted for 4% of the quantity of pesticides used.

The systemic fungicide carbendazim was the most frequently used fungicide, applied to 28% of the total fungicide-treated area, accounting for 2% of the weight of fungicides used. Fosetyl-aluminium, applied to only 8% of the fungicide-treated area, represented 79% of the weight of fungicides applied. Collectively 61% of all fungicide applications were applied to shrub (31%) and cut flower (30%) crops.

The pyrethroid insecticide/acaricide, bifenthrin, accounted for 35% of the insecticide/acaricide-treated area and represented 4% of the quantity of insecticides/acaricides applied. An estimated 61% of all insecticide/acaricides applications were to shrub crops.

Glyphosate was the active ingredient most extensively used on the herbicide-treated area (60%) and accounted for 52% of the weight of herbicides used. Herbicide applications to field grown Christmas and native tree areas, accounted for 94% of the glyphosate applications.

Metaldehyde was the only molluscicide recorded used on approximately 1 hectare of hardy nursery stock crops.

The biological control *Bacillus subtilis* was recorded applied to 2710m² (0.27spha) of mixed area crops to control disease.

Paclobutrazol was the only growth regulator recorded used on hardy nursery stock crops with 58% of applications to shrub crops and the remaining 42% of applications on mixed area crops.

The phenolic derivative cresylic acid accounted for 63% of the mixed formulation area and 86% of the quantity of mixed formulations applied.

A total of 84 products comprising of 65 active ingredients (not including mixed formulation active ingredients and products) were recorded used in this survey. The top fifty active ingredients recorded ranked by application area and quantity applied, are shown in Tables 9 & 10, respectively.

SHRUBS (Table 11)

Shrubs (container-grown plants including conifers and hedging) were grown on 14% (approximately 14ha) of the total area of hardy nursery stock crops grown in Northern Ireland in 2003. A total of 581,295 spray m² (58.1spha) of shrubs were treated with pesticides, and an estimated 319kg of pesticides were applied to the treated area.

An estimated 40% of crop area receiving pesticide applications was treated with fungicides (92% of the weight of pesticides applied). The principal reason given for 91% of fungicide applications was ‘general disease control’. Myclobutanil was the most frequently used fungicide, applied to 30% of the fungicide-treated area, but accounting for less than 1% of the weight of fungicides applied. Fosetyl-aluminium, applied to 16% of the fungicide-treated area, accounted for 98% of the weight of fungicides used.

The residual and contact herbicide oxadiazon was applied to 51% of the herbicide-treated area and accounted for 75% of the weight of herbicides applied to shrubs. An estimated 90% of all herbicides applied to the treated area were for 'general weed control', with the remaining 10% of applications for control of liverworts and mosses.

The pyrethroid active ingredient bifenthrin accounted for 43% of the insecticide/acaricide-treated area and 6% of the weight applied. Aphid control was the reason given for 59% of all bifenthrin applications (34% of all insecticides/acaricides applications), with a further 40% of applications of this active ingredient being applied to control red spider mite (*Tetranychus urticae*).

Metaldehyde was the only molluscicide active ingredient used. It was applied to 6,292 spray m^2 (0.6spha) of shrubs. The growth regulator paclobutrazol was applied to 1,760 spray m^2 (0.2spha) of shrub crops. An estimated 2% of the pesticide-treated area of shrub crops had applications of mixed formulations. Cresylic acid accounted for 59% of the mixed formulation-treated area and 98% of the quantity of mixed formulations used, with 68% of applications of this active ingredient applied for general disease control.

MIXED CROPS (Table 12)

An estimated 7 hectares of mixed crops (alpines, heathers, herbaceous and ornamental container-grown plants) were grown in Northern Ireland in 2003, representing 7% of the area of hardy nursery stock crops grown.

Fungicides were applied to 60% of the pesticide-treated area representing 68% of the weight of pesticides applied. Collectively, the fungicides carbendazim (15%) and iprodione (16%) accounted for 31% of applications to the fungicide-treated area of these crops, with propamocarb hydrochloride representing 86% of the quantity of fungicides used.

An estimated 4ha (13%) of mixed crops received herbicide treatments, accounting for 8% of the quantity of active ingredients used, with oxadiazon applied to 77% of the herbicide-treated area and accounting for 49% of the quantity of herbicides used.

Insecticides/acaricides accounted for approximately 15% of the pesticide-treated area of mixed crops. The pyrethroid bifenthrin was the most commonly used on 71% of the insecticide/acaricides-treated area and accounting for 14% of the quantity of insecticides/acaricides used. An estimated 81% of all insecticide/acaricides applications were as a general insect control.

The biological control *Bacillus subtilis* was applied to 0.3ha as a general disease control. Paclobutrazol was used on 0.1ha of mixed crops. An estimated 10% of the pesticide-treated area of these crops had applications of mixed formulations and similar to shrubs, cresylic acid principally used to control blackspot, was most commonly used accounting for 91% of the mixed formulation-treated area and 99% of the quantity applied.

ORNAMENTAL TREES (Table 13)

The area of ornamental trees recorded grown in Northern Ireland in 2003 was estimated at 4585m^2 (0.5ha). A total of 2.4spha were treated with pesticides and approximately 4kg of pesticides were applied to the treated area.

Fungicides were applied to 44% of the pesticide-treated area of ornamental trees. Carbendazim (33%), chlorothalonil (33%) and iprodione (33%) collectively accounted for 99% of the active ingredients applied to the fungicide-treated area. Overall, less than 1kg of fungicides was applied to ornamental trees during the period of this survey.

Almost one quarter (22%) of all pesticides applied to ornamental trees were herbicides, accounting for 25% of the weight of pesticides used. Isoxaben (34%) and oxadiazon (32%) collectively accounted for 66% of the herbicide-treated area and were applied for general weed control. The only other herbicide active ingredient recorded was quinoclamine, used to control moss and liverwort, which accounted for 34% of the herbicide-treated area and 23% of the quantity of herbicides applied.

Insecticide/acaricides accounted for 29% of the pesticide-treated area but less than 1% of the quantity of pesticides applied to ornamental trees. With the exception of permethrin, insecticide/acaricides usage was evenly distributed between bifenthrin (98% of applications to control aphids), chlorpyrifos, cypermethrin and deltamethrin.

An estimated 4.8% of all applications to the pesticide-treated area (55% of the quantity of pesticides applied) of ornamental trees were other products and mixed formulations. The fungicide/insecticide mix, bupirimate/pirimicarb/triforine accounted for 81% of the mixed formulation area, 1% of the quantity applied, with 68% of applications to control aphids.

ROSES (Table 14)

The area of roses grown in Northern Ireland in 2003 was estimated at 2357m^2 (0.2ha).

The active ingredient myclobutanil was the most frequently used fungicide accounting for 93% of the fungicide-treated area and 50% of the quantity of fungicides applied. The principal reason (86%) cited by growers for fungicide usage on roses was to control blackspot (*Marssonina rosae*).

The only herbicide recorded in use on roses was oxadiazon applied to 93spm^2 .

Insecticides/acaricides accounted for 20% of the total pesticide-treated area of roses and 6% of the quantity of pesticides used. The pyrethroid insecticide cypermethrin, used to control aphids, accounted for 71% of the insecticide/acaricide-treated area and 17% of the quantity used. An estimated 79% of all insecticide/acaricide applications were to control aphids.

Mixed formulations were applied to 59% of the pesticide-treated area, 82% of the quantity of pesticides applied. The fungicide/insecticide mix bupirimate/pirimicarb/triforine applied principally to control blackspot and aphids, accounted for 76% of the mixed formulation-treated area and 38% of the weight of active ingredients used.

The molluscicide metaldehyde was applied to 371spm^2 of roses.

BULBS (Table 15)

An estimated 1.4ha of field-grown bulbs were recorded grown during this survey period.

All fungicides applied to bulbs were as a ‘general disease control’. Carbendazim was the fungicide active ingredient most frequently used, accounting for 93% of the fungicide-treated area and 50% of the quantity of fungicides used. Overall, fungicides accounted for 44% of the pesticide-treated area and 23% of the quantity of pesticides used on bulbs.

All herbicides applied to the treated area were for ‘general weed control’. Glyphosate was the most commonly applied herbicide, accounting for 43% of the herbicide-treated area and 27% of the weight of herbicides applied to field grown bulbs.

Insecticide/acaricides, applied solely to control the large narcissus fly (*Merodon equestris*), accounted for 9% of the total pesticide-treated area and 3% of the quantity of pesticides used on bulbs. The organophosphates dimethoate and chlorpyrifos were the two insecticide/acaricides active ingredients recorded.

Metaldehyde was the only molluscicide recorded and was used on 0.6 spha of field-grown bulbs.

CUT FLOWERS: FIELD AND CONTAINER GROWN (Table 16)

Cut flower crops (including a range of cut flower crops grown in pots/beds outside and field-grown crops e.g. wallflowers) were recorded grown on 11% of the hardy nursery stock crops area. A total of 59spha were recorded treated with pesticides and an estimated 66kg of pesticides were applied to the treated area.

An estimated 51% of the pesticide-treated area of this crop received fungicide applications. Chlorothlonil, applied to 47% of the fungicide-treated area, accounted for 60% of the quantity of fungicides applied to cut flower crops.

Herbicide applications accounted for 49% of the weight of pesticides applied to this crop and accounted for 36% of the pesticide-treated area. Simazine was the herbicide active ingredient most frequently used, accounting for 29% of both the herbicide-treated area and the weight of herbicides applied.

Of the pesticide applications to cut flower crops, insecticides /acaricides accounted for 14% of the pesticide-treated area and 4% of the quantity used. Gamma-HCH applied to control the large narcissus fly (*Merodon equestris*), was the most frequently used insecticide/acaricide active ingredient applied to 71% of the insecticide/acaricide-treated area and accounting for 77% of the quantity of insecticide/acaricides applied. It should be noted however that this active ingredient has been revoked since 2001. Malathion and cypermethrin were the two other insecticide/acaricide active ingredients recorded in use to control aphids.

No other products were recorded in use on cut flower crops during this survey period.

TREES (Table 17)

Trees (including field-grown native species and Christmas trees) were grown on 66% (67ha) of the area of hardy nursery stock crops grown in Northern Ireland in 2003.

Over 99% of all pesticide applications to trees were herbicides applied as a 'general weed control'. Glyphosate was the herbicide most frequently used, accounting for 87% of the herbicide-treated area and 84% of the quantity of herbicides used.

The organophosphorus insecticide/acaricide chlorpyrifos was applied to 0.7ha of trees for 'general insect control' and was the only other pesticide type recorded used on trees during this survey period.

PESTICIDE APPLICATIONS TO COMPOST AND SITE (Tables 18 & 19)

The survey indicated that it is common practice for growers to purchase compost with pesticides incorporated. This compost may subsequently be mixed with other types before planting occurs and it is extremely difficult to accurately estimate total pesticide use in compost. Consequently, the following data refers only to compost treatments applied by the grower or those composts for which the application rate could be verified precisely.

The herbicide active ingredient glyphosate applied to pathways, car parks and around the site of general nursery holdings for general weed control, accounted for 51% of the total herbicide-treated area of nursery site applications and 45% of the weight of herbicides applied (Table 18). Paraquat and oxadiazon collectively accounted for a further 23% of applications and 24% of the weight applied.

The only molluscicide active ingredient recorded in use on nursery sites was metaldehyde, applied to 124,274 spm^2 to control slugs.

An estimated 933 spm^2 received applications of the mixed formulation bupirimate/pirimicarb/triforine, to control whitefly (*Trialeurodes vaporariorum*).

A total of 351kg of insecticides were applied to approximately 5000m^3 of compost to control vine weevil (*Otiorhynchus sulcatus*). The organophosphorus insecticide chlorpyrifos accounted for 75% of the treated area and over 99% of the weight of pesticides applied to compost. Fipronil was the only other insecticide active ingredient recorded in use on compost.

ACKNOWLEDGEMENTS

We, the authors, wish to thank all of the growers who participated in this survey. We are also grateful to Dr. Trevor Mc Callion and Quality assurance Division Inspectors for assistance with the selection of the sample, Mr John Anderson and Mr. Andrew Cuthbert provided invaluable assistance with data collection and input. We are particularly grateful for support from Mr David Kerr (DARD Agri-Food Development Service), for his invaluable advice and information on growing practices of protected ornamental crops.

Figure 1 The proportional distribution of hardy nurserystock crops grown in Northern Ireland, 2003

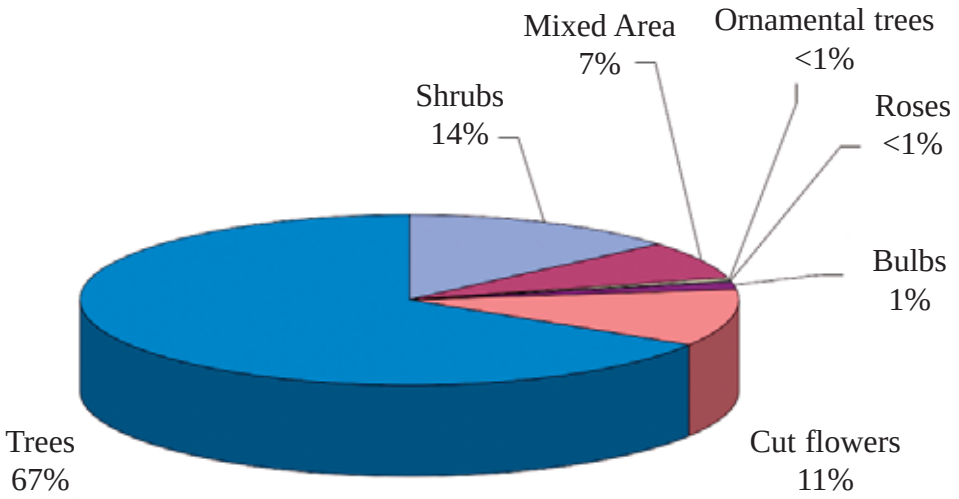

Figure 2 The regional distribution of hardy nurserystock crops grown in Northern Ireland, 2003

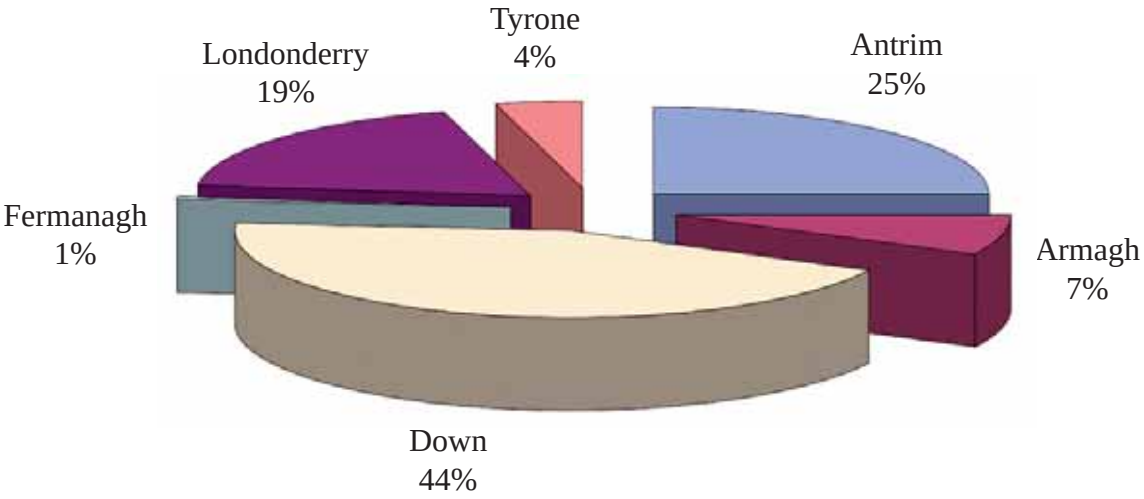

Figure 3 The area of hardy nurserystock crops treated with each pesticide type in the county regions of Northern Ireland, 2003

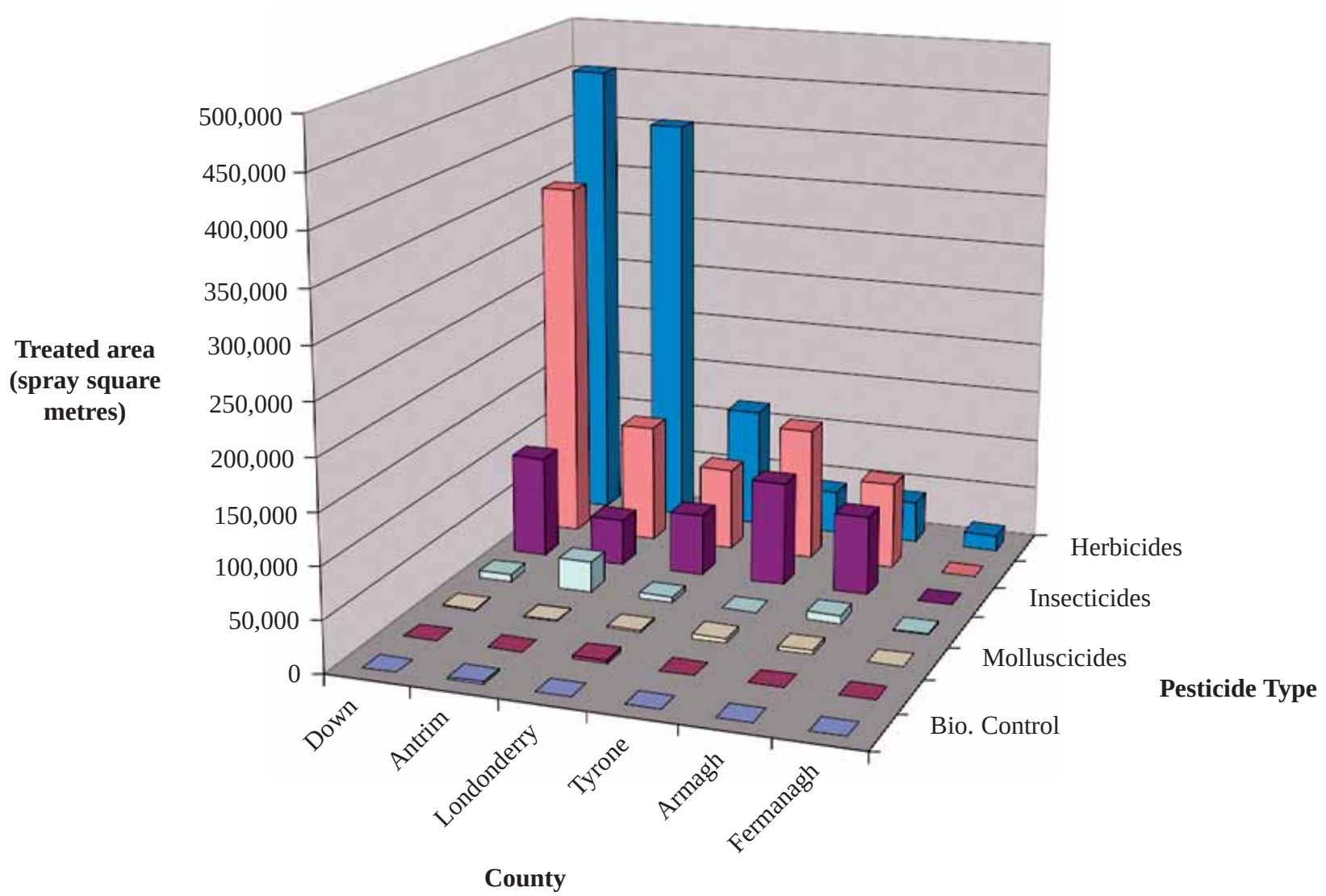

Table 1 **The total number of protected and hardy nursery stock growers and the number of growers sampled in Northern Ireland in 2003.**

County	Total number of growers	Number of growers sampled	(%)
Antrim	52	35	67
Armagh	36	23	64
Down	85	57	67
Fermanagh	12	5	42
Londonderry	33	23	70
Tyrone	15	8	53
Northern Ireland	**233**	**151**	**65**

Table 2 **Estimated area (m^2) of hardy nursery stock crops grown regionally in Northern Ireland 2003.**

	County						
Crop type	Antrim	Armagh	Down	Fermanagh	Londonderry	Tyrone	Northern Ireland
Shrubs	25,312	44,572	12,872	3,750	43,762	8,809	139,077
Mixed area	52,458	4,364	11,886	2,277	2,522	.	73,506
Ornamental trees	601	1,928	259	.	1,796	.	4,585
Roses	487	546	606	118	546	54	2,357
Bulbs field grown	8,496	1,333	.	.	.	4,667	14,496
Cut flowers (field & container)	.	.	98,008	.	.	12,800	110,808
Trees	166,926	22,545	324,791	.	143,267	16,000	673,529
All crops	**254,280**	**75,289**	**448,422**	**6,145**	**191,893**	**42,329**	**1,018,358**

Table 3 **Estimated area (spm^2) of hardy nursery stock crops treated regionally with each pesticide type in Northern Ireland 2003.**

	Pesticide type							
County	**Fungicides**	**Herbicides**	**Insecticides**	**Molluscicides**	**Biological control**	**Growth regulators**	**Mixed Formulations**	**Northern Ireland**
Antrim	115,597	405,504	45,591	622	2,710	.	29,884	599,909
Armagh	84,576	40,162	77,537	4,302	.	.	8,189	214,767
Down	351,984	455,561	99,319	960	.	.	7,467	915,292
Fermanagh	73	15,000	.	.	.	.	1,296	16,369
Londonderry	80,769	117,673	59,776	1,925	.	3,010	5,562	268,714
Tyrone	129,420	41,822	101,040	4,853	.	.	562	277,697
All pesticides	**762,419**	**1,075,722**	**383,263**	**12,663**	**2,710**	**3,010**	**52,960**	**2,292,748**

Table 4 **Estimated quantity (kg) of pesticide active ingredients applied to protected ornamental crops treated regionally with each pesticide type in Northern Ireland 2003.**

	Pesticide type							
County	**Fungicides**	**Herbicides**	**Insecticides**	**Molluscicides**	**Biological control**	**Growth regulators**	**Mixed Formulations**	**Northern Ireland**
Antrim	7.10	38.26	0.26	0.17	0.56	.	8.52	54.86
Armagh	2.78	7.93	1.25	0.38	.	.	3.75	16.09
Down	90.74	65.50	3.41	.	.	.	6.80	166.48
Fermanagh	<0.01	1.24	.	.	.	.	0.23	1.47
Londonderry	3.69	13.84	1.49	0.50	.	0.01	3.36	22.89
Tyrone	257.95	6.25	0.32	0.28	.	.	0.02	264.83
All pesticides	**362.26**	**133.03**	**6.73**	**1.36**	**0.56**	**0.01**	**22.67**	**526.62**

Table 5 **Estimated area (spm²) of pesticide active ingredients applied to hardy nursery stock crops treated with each pesticide type in Northern Ireland 2003.**

	Pesticide type							
Crop Type	**Fungicides**	**Herbicides**	**Insecticides**	**Molluscicides**	**Biological control**	**Growth regulators**	**Mixed Formulations**	**Northern Ireland**
Shrubs	233,787	96,622	232,726	6,292	.	1,760	10,108	581,295
Mixed area	181,567	39,775	45,478	.	2,710	1,250	30,002	300,782
Ornamental trees	10,664	5,464	7,091	.	.	.	1,174	24,393
Roses	3,528	93	4,032	371	.	.	11,676	19,699
Bulbs field grown	36,667	33,659	7,333	6,000	.	.	.	83,659
Cut flowers(field &container)	296,208	210,631	79,666	.	.	.	.	586,504
Trees	.	689,479	6,938	.	.	.	.	696,416
All crops	**762,419**	**1,075,722**	**383,263**	**12,663**	**2,710**	**3,010**	**52,960**	**2,292,748**

Table 6 **Estimated quantity (kg) of pesticide active ingredients applied to hardy nursery stock crops treated with each pesticide type in Northern Ireland 2003.**

	Pesticide type							
Crop Type	**Fungicides**	**Herbicides**	**Insecticides**	**Molluscicides**	**Biological control**	**Growth regulators**	**Mixed Formulations**	**Northern Ireland**
Shrubs	293.37	13.82	2.79	.	.	0.01	8.17	319.28
Mixed area	35.42	4.16	0.35	.	0.56	<0.01	11.49	51.98
Ornamental trees	0.70	0.99	0.10	.	.	.	2.22	4.00
Roses	0.04	0.04	0.06	0.03	.	.	0.79	0.96
Bulbs field grown	1.77	5.46	0.25	0.22	.	.	.	7.69
Cut flowers(field &container)	30.95	32.06	2.93	.	.	.	.	65.94
Trees	.	76.50	0.25	.	.	.	.	76.75
All crops	**362.26**	**133.03**	**6.73**	**1.36**	**0.56**	**0.01**	**22.67**	**526.62**

Table 11 **Shrubs: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Black spot	*Botrytis*	Rust	Disease Control	Mildew	Liverwort/ Moss	General Weed Control	Total area treated (sp m^2)	Total quantity applied (kg)
Fungicides									
Benomyl	.	.	.	.	6	.	.	6	<0.01
Bupirimate	.	.	.	64	.	.	.	64	<0.01
Carbendazim	.	.	.	33,415	.	.	.	33,415	1.17
Chlorothalonil	.	.	.	5,288	.	.	.	5,288	0.76
Chlorothalonil/metalaxyl	.	.	.	4,048	.	.	.	4,048	0.05
Copper-ammonium carbonate	.	.	.	.	2,135	.	.	2,135	0.01
Fenbuconazole	.	.	.	134	.	.	.	134	<0.01
Fosetyl-aluminium	.	.	.	32,864	3,585	.	.	36,449	286.51
Furalaxyl	.	.	.	112	.	.	.	112	0.01
Iprodione	.	1,008	.	43,703	183	.	.	44,894	1.04
Mancozeb	.	.	231	.	.	.	.	231	0.01
Metalaxyl/thiram	.	.	.	161	.	.	.	161	0.01
Myclobutanil	107	.	.	56,516	13,840	.	.	70,463	0.98
Penconazole	.	.	.	623	372	.	.	995	0.04
Prochloraz	.	.	.	24,240	.	.	.	24,240	2.76
Propiconazole	.	.	.	10,883	.	.	.	10,883	0.01
Zineb	.	.	.	.	269	.	.	269	0.02
All fungicides	**107**	**1,008**	**231**	**212,050**	**20,391**	**.**	**.**	**233,787**	**293.37**
Herbicides & desiccants									
Isoxaben	.	.	.	.	.	27	34,126	34,152	1.11
Oxadiazon	.	.	.	.	.	.	49,238	49,238	10.44
Paraquat/diquat/amitrole/simazine	.	.	.	.	.	.	2,153	2,153	0.94
Quinoclamine	.	.	.	.	.	9,429	.	9,429	1.29
Trifluralin	.	.	.	.	.	.	1,650	1,650	0.05
All herbicides	**.**	**.**	**.**	**.**	**.**	**9,455**	**87,166**	**96,622**	**13.82**

Table 11 (cont.) **Shrubs: pesticide-treated area (spm²), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Aphids	Red spider mite	Vine weevil	Whitefly	Insect Control	Slugs	Growth regulation	Total area treated (sp m²)	Total quantity applied (kg)
Insecticides									
Abamectin	.	1,382	.	.	.	.	.	1,382	<0.01
Bifenthrin	59,701	40,262	.	.	744	.	.	100,707	0.18
Chlorpyrifos	.	.	534	.	20,636	.	.	21,170	0.99
Cypermethrin	7	.	.	3,361	77,049	.	.	80,417	0.41
Deltamethrin	550	.	.	.	2,413	.	.	2,963	<0.01
Dimethoate	.	.	.	.	3,203	.	.	3,203	0.04
Gamma-HCH	.	.	.	.	64	.	.	64	<0.01
Imidacloprid	.	.	1,019	.	.	.	.	1,019	1.03
Malathion	516	.	.	.	374	.	.	890	0.05
Nicotine	.	.	.	.	1,920	.	.	1,920	0.05
Permethrin	18,457	.	.	.	.	.	.	18,457	0.03
Pirimicarb	533	.	.	.	.	.	.	533	0.01
All insecticides	**79,765**	**41,645**	**1,553**	**3,361**	**106,402**	**.**	**.**	**232,726**	**2.79**
Molluscicides									
Metaldehyde	.	.	.	.	.	6,292	.	6,292	1.11
All molluscicides	**.**	**.**	**.**	**.**	**.**	**6,292**	**.**	**6,292**	**1.11**
Growth regulators									
Paclobutrazol	.	.	.	.	.	.	1,760	1,760	0.01
All growth regulators	**.**	**.**	**.**	**.**	**.**	**.**	**1,760**	**1,760**	**0.01**

Table 11 (cont.) **Shrubs: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Aphids	Blackspot & Aphids	Liverwort/ Moss	Insect Control	Disease Control	Total area treated (sp m^2)	Total quantity applied (kg)
Mixed formulations							
Copper sulphate	.	.	.	2	.	2	0.01
Bupirimate/pirimicarb/triforine	623	3,480	.	.	.	4,103	0.14
Cresylic acid	.	.	1,920	.	4,084	6,004	8.02
All mixed formulations	**623**	**3,480**	**1,920**	**2**	**4,084**	**10,108**	**8.17**

Table 12 **Mixed areas: pesticide-treated area (spm²), quantities used (kg) and reasons for use.**

Pesticide type & formulation	*Botrytis*	Rust	Damping Off	Disease control	Mildew	Liverwort/ Moss	General Weed control	Total area treated (sp m²)	Total quantity applied (kg)
Fungicides									
Benomyl	.	.	.	13,109	.	.	.	13,109	0.28
Bupirimate	.	.	.	13	331	.	.	344	0.01
Bupirimate/triforine	.	.	.	.	10,171	.	.	10,171	0.25
Carbendazim	17,630	.	.	9,328	4	.	.	26,962	0.63
Chlorothalonil	.	194	.	3,033	.	.	.	3,227	0.39
Copper-ammonium carbonate	.	.	194	.	.	.	.	194	<0.01
Etridiazole	.	.	3,884	.	.	.	.	3,884	0.12
Fosetyl-aluminium	.	.	2	21,818	.	.	.	21,821	0.74
Furalaxyl	.	.	869	.	.	.	.	869	0.04
Iprodione	230	.	.	28,678	.	.	.	28,908	0.99
Mancozeb	.	.	.	17,337	.	.	.	17,337	1.14
Myclobutanil	.	355	.	.	.	.	.	355	<0.01
Oxycarboxin	.	194	.	.	.	.	.	194	<0.01
Prochloraz	.	.	.	219	.	.	.	219	0.13
Propamocarb hydrochloride	.	.	12	30,023	.	.	.	30,035	30.48
Pyrifenox	.	.	.	.	22,560	.	.	22,560	0.01
Thiram	.	.	.	176	1,200	.	.	1,376	0.18
Tolclofos-methyl	.	.	.	2	.	.	.	2	0.02
All fungicides	**17,861**	**744**	**4,962**	**123,735**	**34,266**	**.**	**.**	**181,567**	**35.42**
Herbicides & desiccants									
Glyphosate	.	.	.	.	.	.	8,750	8,750	0.92
Isoxaben	.	.	.	.	.	.	176	176	0.02
Oryzalin	.	.	.	.	.	176	.	176	0.73
Oxadiazon	.	.	.	.	.	.	30,498	30,498	2.04
Quinoclamine	.	.	.	.	.	176	.	176	0.45
All herbicides	**.**	**.**	**.**	**.**	**.**	**351**	**39,424**	**39,775**	**4.16**

Table 12 (cont.) **Mixed areas: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Aphids	Vine weevil	Insect control	Disease control	Growth regulation	Blackspot & Aphids	Liverwort/ Moss	Whitefly	Total area treated (sp m^2)	Total quantity applied (kg)
Insecticides										
Abamectin	.	.	230	.	.	.	.	.	230	<0.01
Bifenthrin	4,752	1,250	26,133	.	.	.	.	.	32,135	<0.01
Buprofezin	389	.	.	.	.	.	.	.	389	<0.01
Chlorpyrifos	.	.	1,272	.	.	.	.	.	1,272	0.1
Cypermethrin	.	.	1,440	.	.	.	.	.	1,440	<0.01
Deltamethrin	548	.	1,272	.	.	.	.	.	1,820	<0.01
Dichlorvos	.	.	180	.	.	.	.	.	180	<0.01
Fatty acids	50	.	.	.	.	.	.	.	50	<0.01
Fenbutatin oxide	.	.	1,123	.	.	.	.	.	1,123	<0.01
Gamma-HCH	.	.	13	.	.	.	.	.	13	<0.01
Imidacloprid	432	48	259	.	.	.	.	.	739	<0.01
Malathion	488	.	1,320	.	.	.	.	.	1,808	0.1
Permethrin	4	.	2,710	.	.	.	.	.	2,714	0.1
Pymetrozine	240	.	.	.	.	.	.	.	240	<0.01
Spinosad	.	.	29	.	.	.	.	.	29	<0.01
Teflubenzuron	.	.	170	.	.	.	.	.	170	<0.01
Tetradifon	.	.	1,123	.	.	.	.	.	1,123	<0.01
All insecticides	**6,903**	**1,298**	**37,277**	**.**	**.**	**.**	**.**	**.**	**45,478**	**0.3**
Biological control										
Bacillus subtilis	.	.	.	2,710	.	.	.	.	2,710	0.6
All biological controls	**.**	**.**	**.**	**2,710**	**.**	**.**	**.**	**.**	**2,710**	**0.6**
Growth regulators										
Paclobutrazol	.	.	.	.	1,250	.	.	.	1,250	<0.01
All growth regulators	**.**	**.**	**.**	**.**	**1,250**	**.**	**.**	**.**	**1,250**	**<0.01**
Mixed formulations										
Bupirimate/pirimicarb/triforine	.	.	.	.	.	2,618	.	.	2,618	0.1
Cresylic acid	.	.	.	.	.	26,133	1,250	.	27,383	11.4
All mixed formulations	**.**	**.**	**.**	**.**	**.**	**28,751**	**1,250**	**.**	**30,002**	**11.5**

Table 13 **Ornamental trees: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Disease control	Liverwort/ Moss	General weed control	Aphids	Insect control	Blackspot & Aphids	Total area treated (sp m^2)	Total quantity applied (kg)
Fungicides								
Carbendazim	3,520	.	.	.	.	.	3,520	0.07
Chlorothalonil	3,520	.	.	.	.	.	3,520	0.55
Iprodione	3,520	.	.	.	.	.	3,520	0.07
Mancozeb	48	.	.	.	.	.	48	<0.01
Myclobutanil	56	.	.	.	.	.	56	<0.01
All fungicides	**10,664**	**.**	**.**	**.**	**.**	**.**	**10,664**	**0.70**
Herbicides & desiccants								
Isoxaben	.	.	1,852	.	.	.	1,852	0.05
Oxadiazon	.	.	1,760	.	.	.	1,760	0.70
Quinoclamine	.	1,852	.	.	.	.	1,852	0.23
All herbicides	**.**	**1,852**	**3,612**	**.**	**.**	**.**	**5,464**	**0.99**
Insecticides								
Bifenthrin	.	.	.	1,557	229	.	1,786	<0.01
Chlorpyrifos	.	.	.	.	1,760	.	1,760	0.09
Cypermethrin	.	.	.	.	1,760	.	1,760	0.01
Deltamethrin	.	.	.	13	1,760	.	1,773	<0.01
Permethrin	.	.	.	13	.	.	13	<0.01
All insecticides	**.**	**.**	**.**	**1,582**	**5,509**	**.**	**7,091**	**0.10**
Mixed formulations								
Bupirimate/pirimicarb/triforine	229	.	.	648	.	79	956	0.03
Cresylic acid	80	.	.	.	.	.	80	0.12
Tar oil	138	.	.	.	.	.	138	2.07
All mixed formulations	**448**	**.**	**.**	**648**	**.**	**79**	**1,174**	**2.22**

Table 14 **Roses: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Blackspot	Disease control	General weed control	Aphids	Vine weevil	Insect control	Slugs	Blackspot & Aphids	Total area treated (sp m^2)	Total quantity applied (kg)
Fungicides										
Bupirimate/triforine	51	73	.	.	.	.	.	.	125	0.01
Metalaxyl/thiram	115	.	.	.	.	.	.	.	115	0.01
Myclobutanil	2,880	408	.	.	.	.	.	.	3,288	0.02
All fungicides	**3,047**	**481**	**.**	**.**	**.**	**.**	**.**	**.**	**3,528**	**0.04**
Herbicides & desiccants										
Oxadiazon	.	.	93	.	.	.	.	.	93	0.04
All herbicides	**.**	**.**	**93**	**.**	**.**	**.**	**.**	**.**	**93**	**0.04**
Insecticides										
Bifenthrin	.	.	.	183	.	365	.	.	549	<0.01
Cypermethrin	.	.	.	2,880	.	.	.	.	2,880	0.01
Deltamethrin	.	.	.	73	.	.	.	.	73	<0.01
Imidacloprid	.	.	.	.	417	.	.	.	417	0.04
Malathion	.	.	.	.	.	77	.	.	77	0.01
Permethrin	.	.	.	37	.	.	.	.	37	<0.01
All insecticides	**.**	**.**	**.**	**3,173**	**417**	**442**	**.**	**.**	**4,032**	**0.06**
Molluscicides										
Metaldehyde	.	.	.	.	.	.	371		371	0.03
All molluscicides	**.**	**.**	**.**	**.**	**.**	**.**	**371**		**371**	**0.03**
Mixed formulations										
Bupirimate/pirimicarb/triforine	276	365	.	653	.	.	.	7,546	8,840	0.30
Permethrin/sulphur/triforine	.	.	.	.	.	.	.	2,836	2,836	0.50
All mixed formulations	**276**	**365**	**.**	**653**	**.**	**.**	**.**	**10,382**	**11,676**	**0.79**

Table 15 **Field grown bulbs: pesticide-treated area (spm²), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Disease control	General weed control	Narcissi fly	Slugs	Total area treated (sp m²)	Total quantity applied (kg)
Fungicides						
Azoxystrobin	1,333	.	.	.	1,333	0.03
Carbendazim	34,000	.	.	.	34,000	0.88
Sulphur	1,333	.	.	.	1,333	0.85
All fungicides	**36,667**	**.**	**.**	**.**	**36,667**	**1.77**
Herbicides & desiccants						
Chlorpropham/linuron	.	10,667	.	.	10,667	3.20
Glyphosate	.	14,496	.	.	14,496	1.49
Paraquat	.	8,496	.	.	8,496	0.77
All herbicides	**.**	**33,659**	**.**	**.**	**33,659**	**5.46**
Insecticides						
Chlorpyrifos	.	.	1,333	.	1,333	0.06
Dimethoate	.	.	6,000	.	6,000	0.18
All insecticides	**.**	**.**	**7,333**	**.**	**7,333**	**0.25**
Molluscicides						
Metaldehyde	.	.	.	6,000	6,000	0.22
All molluscicides	**.**	**.**	**.**	**6,000**	**6,000**	**0.22**

Table 16 Cut flowers field and container grown: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.

Pesticide type & formulation	Damping off	Disease control	General weed control	Aphids	Narcissi fly	Total area treated (sp m^2)	Total quantity applied (kg)
Fungicides							
Carbendazim	.	112,388	.	.	.	112,388	5.62
Chlorothalonil	.	137,740	.	.	.	137,740	18.69
Iprodione	.	23,040	.	.	.	23,040	0.35
Propamocarb hydrochloride	.	11,520	.	.	.	11,520	5.53
Tolclofos-methyl	11,520	.	.	.	.	11,520	0.77
All fungicides	**11,520**	**284,688**	**.**	**.**	**.**	**296,208**	**30.95**
Herbicides & desiccants							
Diquat	.	.	56,194	.	.	56,194	3.37
Propachlor	.	.	16,303	.	.	16,303	11.08
Simazine	.	.	60,819	.	.	60,819	9.24
Glyphosate	.	.	17,425	.	.	17,425	1.88
Metazachlor	.	.	13,991	.	.	13,991	2.45
Oxadiazon	.	.	9,366	.	.	9,366	1.85
Paraquat	.	.	36,534	.	.	36,534	2.19
All herbicides	**.**	**.**	**210,632**	**.**	**.**	**210,632**	**32.06**
Insecticides							
Gamma-HCH	.	.	.	.	56,194	56,194	2.25
Malathion	.	.	.	14,106	.	14,106	0.68
Cypermethrin	.	.	.	9,366	.	9,366	0.01
All insecticides	**.**	**.**	**.**	**23,472**	**56,194**	**79,666**	**2.93**

Table 17 **Trees: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	General weed control	General Insect control	Total area treated (sp m^2)	Total quantity applied (kg)
Herbicides & desiccants				
Clopyralid/triclopyr	12,000	.	12,000	0.144
Glyphosate	602,414	.	602,414	64.637
Oxadiazon	778	.	778	0.31
Paraquat	6,747	.	6,747	0.405
Propyzamide	67,541	.	67,541	11.008
All herbicides	**689,479**	**.**	**689,479**	**76.504**
Insecticides				
Chlorpyrifos	.	6,938	6,938	0.25
All insecticides	**.**	**6,938**	**6,938**	**0.25**

Table 18 **Nursery site: pesticide-treated area (spm^2), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Weeds on site (kg)	Weeds on site (sp m^2)	Slugs (kg)	Slugs (sp m^2)	Bulbs (kg)	Bulbs (sp m^2)	Total quantity applied (kg)	Total area treated (sp m^2)
Herbicides & desiccants								
Chlorthal-dimethyl	0.43	4,625	.	.	.	.	0.43	4,625
Clopyralid/triclopyr	0.17	1,920	.	.	.	.	0.17	1,920
Dichlobenil	12.50	22,383	.	.	.	.	12.50	22,383
Diquat/paraquat	1.90	16,393	.	.	.	.	1.90	16,393
Glufosinate-ammonium	14.61	108,067	.	.	.	.	14.61	108,067
Glyphosate	67.41	550,194	.	.	.	.	67.41	550,194
Isoxaben	0.50	19,777	.	.	.	.	0.50	19,777
Oxadiazon	24.27	125,504	.	.	.	.	24.27	125,504
Paraquat	11.08	125,649	.	.	.	.	11.08	125,649
Paraquat/diquat/amitrole/simazine	6.12	15,559	.	.	.	.	6.12	15,559
Propyzamide	1.51	23,143	.	.	.	.	1.51	23,143
Quinoclamine	1.59	8,209	.	.	.	.	1.59	8,209
Simazine	7.78	49,886	.	.	.	.	7.78	49,886
All herbicides	**149.85**	**1,071,310**	**.**	**.**	**.**	**.**	**149.85**	**1,071,310**
Molluscicides								
Metaldehyde	.	.	6.44	124,274	.	.	6.44	124,274
All molluscicides	**.**	**.**	**6.44**	**124,274**	**.**	**.**	**6.44**	**124,274**
Mixed formulations								
Bupirimate/pirimicarb/triforine	.	.	.	.	<0.1	933	<0.1	933
All mixed formulations	**.**	**.**	**.**	**.**	**<0.1**	**933**	**<0.1**	**933**

Table 19 **Compost: pesticide-treated area (cubic metres), quantities used (kg) and reasons for use.**

Pesticide type & formulation	Vine weevil (kg)	Vine weevil cubic metres	Total quantity applied (kg)	Total area treated cubic metres
Insecticides/acaricides				
Chlorpyrifos	349.52	3744	349.52	3744
Fipronil	1.54	1254	1.54	1254
All insecticides/acaricides	**351.06**	**4997**	**351.06**	**4997**

Northern Ireland Pesticide Usage Survey Published Reports Appendix 1

Report No.	Report title	ISBN
99	Grassland & Fodder Crops 1989	1-855 27 079 X
105	Arable Crops 1990	1-855 27 130 3
106	Soft Fruit Crops 1990	1-855 27 149 4
109	Vegetable Crops 1991	1-855 27 137 0
110	Protected Crops 1991 (edible & ornamental)	1-855 27 283 0
111	Mushroom Crops 1991	1-855 27 150 8
117	Arable Crops 1992	1-855 27 193 1
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