PESTICIDE USAGE IN NORTHERN IRELAND

Survey Report 301

Northern Ireland Top Fruit Crops 2020

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PESTICIDE USAGE SURVEY REPORT

NORTHERN IRELAND
TOP FRUIT CROPS
2020

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(An estimated 91% of Northern Ireland top fruit is produced in County Armagh)

SUMMARY

This report presents information from a survey of the pesticide usage practices of top fruit growers in Northern Ireland in 2020. This is the eleventh pesticide usage survey to be conducted on top fruit crops in the region since 1992. There was an estimated total of 202 top fruit holdings in Northern Ireland in 2020. Since the previous survey, the total area of top fruit crops grown decreased by 9% to 1,362 hectares, and a slight decrease of 8% of the area of Bramley apples grown. A sample of 60 growers was selected to provide information on crop applications, storage treatments and orchard floor treatments. An estimated 91% of all top fruit crops were grown in County Armagh, with Bramley apple orchards accounting for 98% of the total top fruit grown in Northern Ireland. There was an estimated 38,586 tonnes of Bramley apples harvested in 2020, a 21% decrease compared to 2018.

Overall, an estimated 18.4 tonnes of pesticide active ingredients (fungicides, herbicides, insecticides and growth regulators) were applied to 27,355 spray hectares. The pesticide-treated area decreased by 10% compared with 2018, and the weight of active ingredients applied decreased by 18%.

Fungicide application accounted for 86% of total pesticide-treated area (not including 'other' products) and 91% of weight applied. When compared with 2018, the area treated with fungicides decreased by 8%, and the weight of fungicides applied decreased by 20%. Captan (24%), dodine (11%), pyrimethanil (10%), and mancozeb (9%) were the fungicide active ingredients most commonly used on top fruit crops, collectively accounting for 54% of fungicide-treated area. An estimated 88% of all fungicide applications were applied to control apple scab (*Venturia inaequalis*).

Insecticide and acaricide application represented 6% and <1% of total pesticide use by area treated and weight of active substance applied, respectively. The area treated with insecticides and acaricides decreased by 28% when compared with 2018. Deltamethrin represented 45% of the insecticide treated area, an increase of 50% since 2018. Chlorantraniliprole accounted for 17% of the insecticide treated area. The moulting accelerator, methoxyfenozide accounted for 16% of insecticide treated area, a three-fold decrease since 2018. The use of the pyrethroid insecticide cypermethrin decreased by 39%, representing 11% of total insecticide application. The pyridine carboxamide flonicamid accounted for 9% of insecticide treated area. Aphid control accounted for 24% of insecticide application and a further 39% was attributed to 'general insect control'.

Herbicide application represented 4% of total pesticide use by area treated and 8% of weight applied. Overall, the area treated with herbicide decreased by 14%, but the weight of herbicides applied increased by 6%, when compared with 2018. Glyphosate was the most frequently used herbicide accounting for 46% of total herbicide application. The formulation 2,4-D/glyphosate accounted for 38% of the total herbicide treated area. The most common weed management practice was to apply herbicides in strips under the tree canopy and mow the inter-row grass area between the rows of trees, with 93% of growers using this method.

The remaining 7% of growers either mowed or grazed the strips under the tree canopy in addition to the inter-row area.

Growth regulators accounted for 3% of the pesticide-treated area and less than 1% of the total weight of pesticide applied. Gibberellins and prohexadione were the only growth regulator active ingredients applied. Prohexadione accounted for 82% of the area treated with a growth regulator and 99% of the total weight of growth regulator applied.

An estimated 7.8 tonnes of 'other products' were applied to 5,570 spray hectares. These included foliar feeds, trace elements and calcium-based products. A majority of applications were to treat potential nutritional disorders.

Data were also collected on post-harvest storage treatments applied to top fruit crops. Only Bramley apples were stored with an estimated 16,023 tonnes of which 13,390 tonnes were treated. The pesticide active 1-Methylcyclopropene was the only pesticide active used on stored top fruit crops in 2020.

INTRODUCTION

As a participant in the UK Working Party on Pesticide Usage Surveys, the Agri-Food and Biosciences Institute (AFBI) on behalf of the Department of Agriculture, Environmental and Rural Affairs for Northern Ireland (DAERA), conducts a programme of surveys to examine pesticide usage in all sectors of the agricultural and horticultural industries. Principally, the data collected provides information for consideration by the UK Expert Committee on Pesticides. In addition, the information may also be used by those involved in residue testing, for public information and to evaluate the impact of policy and trends in pesticide usage.

This is the eleventh survey of pesticide usage on top fruit crops in Northern Ireland. Results from the previous surveys which reported on pesticide usage practices on top fruit crops in 1992 (Kidd *et al*., 1994), 1997 (Kidd *et al*., 2001), 2002 (Kearns *et al*., 2004), 2006 (Kearns *et al*., 2007), 2008 (Kirbas *et al*., 2009), 2010 (Lavery *et al*., 2011), 2012 (Lavery *et al*., 2013), 2014 (Lavery *et al*., 2015),2016 (Jess *et al*., 2017) and 2018 (Kirbas *et al*., 2019) are included in the report for comparative purposes. A list of published Northern Ireland Pesticide Usage Survey reports is shown in Appendix 1.

METHODS

Using the Northern Ireland Agricultural Census, June 2020 (Anon., 2020) and also Basic Farm Payment Scheme data (unpublished), a sample of holdings to be surveyed was selected. The sample was stratified into five county regions of Northern Ireland, (there is limited top fruit production in County Londonderry, which was omitted from this survey) and into five size groups based on the total area of top fruit crops grown in each county. The total number of holdings, together with the number surveyed, are shown in Table 1. Due to the relatively low numbers involved, counties Antrim, Down, Fermanagh and Tyrone have been combined and renamed ‘All other counties’.

The survey period comprises the end of the 2019 harvest to the end of the 2020 harvest. The purpose of the survey was explained to selected growers in preliminary correspondence. A total of 60 holdings (representing 30% of all top fruit growers) was contacted and data collected by telephone and email. The growers’ reasons for pesticide use were also included, but may not always seem appropriate. Holdings selected in the original sample which were unable to provide data were replaced with those from the same county and size group held on a reserve list.

The Covid pandemic and resulting restrictions that commenced in early 2020 have severely impacted our capability to conduct the survey programme. In particular, we have been unable to complete personal interviews, relying on telephone or email correspondence, which is not always convenient to participants. Due to the changes in our data collection method we were increasingly faced with incomplete or missing data. However, we are pleased that despite these drawbacks, we are able to present the report in a timely manner.

The collected data were analysed using SPSS (Statistical Package for the Social Sciences) software.

DEFINITIONS AND NOTES

- **'Grown area'** refers to the actual planted area of crop, and is referred to in hectares (ha).
- **'Basic area'** refers to the actual planted area of crop, which was treated with at least one pesticide, and is referred to in hectares (ha).
- **'Pesticide-treated area'** refers to the total area treated with a pesticide (fungicides, herbicides, insecticides and acaracides and growth regulators) which includes all repeated applications to the basic area, and is referred to in spray hectares (spha).
- **'Spray applications'** refers to the number of treatments by any pesticide type to the treated areas.
- Generally, orchards recorded in this survey are laid out with trees planted in rows and the area between the rows, referred to in the report as the **'inter-row'** area, is sown with grass**. 'Herbicide strip'** refers to the area beneath the canopy of each tree. Herbicide treatments are applied solely to 'Herbicide strips' and not the entire orchard floor.
- **'Reason for treatment'**; the reasons reported for the use of pesticides are the growers' stated Reason for treatment and may not reflect label recommendations.
- Non-fruiting and fruiting crops were combined and recorded only as **'Bramley apples'** and **'Other' top fruit** which covered all ages of top fruit crops. Non-fruiting crops are generally newly planted trees that have not yet produced fruit.
- **'Rounding'**; due to rounding of figures, there may be slight differences in totals both within and between tables.
- **Log10 scales** have been used in Figures 4, 5 12 and 13 to assist data visualization as the difference between measures is comparatively large.

RESULTS AND DISCUSSION

Crops

The estimated area of top fruit crops grown, and the area surveyed are shown in Table 2, together with the proportion (%) of each crop surveyed. An estimated 93% of the total area of top fruit crops was grown in County Armagh, with Bramley apples accounting for 98% of the total area of top fruit crops grown. Other top fruit crops, comprising cooking apples, dessert apples, pears and plums, accounted for the remaining 2%. (Table 3, Figure 1).

Regional Pesticide Usage (Tables 4 & 5, Figures 4 & 5)

Regionally, County Armagh is the main production centre for top fruit in Northern Ireland (primarily Bramley apples), accounting for 95% of the total pesticide-treated area and 94% of the weight of pesticides applied. A very limited quantity of top fruit is produced in the remaining counties of Northern Ireland.

Pesticide Usage on Crops (Tables 6 & 7, Figures 19 to 31)

The estimated quantities of pesticide active ingredients applied and the area of crops treated with pesticides are shown in Tables 6 & 7 (Figures 19 to 31). Bramley apples accounted for 98% of the pesticide-treated area and 99% of the weight of active ingredients applied. 'Other' top fruit crops accounted for the remainder of both the weight of pesticides applied and the pesticide-treated area.

Number of Spray Applications (Table 8)

The mean number of spray applications of pesticides to top fruit crops is shown in Table 8. All pesticide types were used on all crops. The total grown area of top fruit crops received at least one pesticide application.

Bramley apples received a mean of 17 fungicide applications from 13 spray rounds. On average these crops also received 2 herbicide applications, 2 insecticide/acaricide applications and 2 applications of growth regulators. Bramley apples also received on average 7 applications of 'other products' from 5 spray rounds.

'Other' top fruit crops received a mean of 15 fungicide applications from 9 spray rounds, 2 herbicide applications, 2 insecticide/acaricides applications, and 7 applications of 'Other products'. There were no growth regulators applied to 'other' top fruit.

Total Pesticide Usage (Tables 4, 5, 9, 10, 11 & 12, Figures 2, 3, 4 & 5)

Approximately 18.4 tonnes of pesticide active ingredients (including fungicides, herbicides, insecticides and acaracides and growth regulators) were applied to 27,355 spray hectares of top fruit crops grown in Northern Ireland in 2020. In addition to this, approximately 7.8 tonnes of 'other' products were applied to 5,570 spray hectares. (Tables 4 & 5, Figures 4 & 5).

Fungicides were applied to 86% of the pesticide-treated area, representing 91% of the weight of pesticides applied. Insecticides/acaricides, applied to 6% of the pesticide-treated area, represented less than 1% of the total weight of pesticides used. Herbicides accounted for 4% of the area treated and 8% of the total weight of pesticides used. Growth regulators represented 3% of the pesticide-treated area and less than 1% of the weight of active ingredients applied. The pesticide groups, comprising the active ingredients and formulations applied are shown in Tables 9 and 10.

Captan was applied to 24% of the fungicide-treated area, representing 37% of the weight of fungicides applied. Dodine accounted for a further 11% of the fungicide-treated area and 12% of the weight of fungicides applied. Pyrimethanil was applied to 10% of the fungicide-treated area, accounting for 5% of the weight of fungicides applied, while mancozeb was applied to 9% of the fungicide-treated area, accounting for 18% of the weight of fungicides applied. Dithianon was applied to 5% of the fungicide-treated area and represented 2% of the weight of fungicides applied. Fungicide applications to orchards for the control of apple scab (*Venturia inaequalis*) accounted for 88% of all fungicides used. The remaining 12% of fungicide applications were for canker (*Nectria galligena*), mildew (*Podosphaera leucotricha*), rot control and storage aid. In total, 22 fungicide active ingredients were applied to Bramley apple crops.

Glyphosate (applied to 46% of the herbicide-treated area) was the most commonly applied herbicide active ingredient accounting for 41% of the weight of herbicide active ingredients applied. The formulation of 2,4-D/glyphosate accounted for 38% of herbicide-treated area and 54% of the weight of herbicide active ingredients applied. Other herbicides containing active ingredients dicamba/MCPA/mecoprop-P in different formulations accounted for the remaining herbicide application.

The pyrethroid active ingredient deltamethrin was applied to 45% of the insecticide-treated area but only accounted for 9% of the weight of insecticides applied. The diacylhydrazine active ingredient methoxyfenozide represented 16% of the insecticide/acaricide-treated area and 47% of the weight of insecticides applied. The ryanodine receptor modulator active ingredient chlorantraniliprole represented a further 17% of both the insecticide/acaricide-treated area and the weight of insecticides applied. General insect control accounted for 39% of insecticide application, with a further 25% applied to control aphids. Control of *Blastobasis* spp. accounted for only 6% of insecticide application to top fruit in Northern Ireland.

Caterpillars, capids, codling moth and woolly aphid were the other reasons given for insecticide application.

Growth regulators were applied to an estimated 933 spray hectares of top fruit crops. The cyclohexanecarboxylate growth regulator prohexadione represented 82% of the area treated and 99% of the weight of growth regulators applied. Gibberellins accounted for the remaining 18% of the treated area and only 1% of the weight of growth regulators applied. Growth regulators were primarily applied to control and suppress shoot growth on the apple trees.

The active ingredients recorded, ranked by application area and weight applied, are shown in Tables 11 & 12, respectively.

An estimated 7.8 tonnes of 'other products' were applied to 5,570 spray hectares of top fruit crops (Table 15, Figures 28 & 29). A total of 22 'other products' were applied. These included foliar feeds, trace elements and calcium-based products, of which, a majority were used to treat potential nutritional disorders. Calcium-based products were applied to 48% of the treated area of 'other products' used, primarily as foliar feeds and trace elements. Nitrogen-based products were applied to 22% of the area treated, representing 33% of the weight of 'other products' applied. Seaweed extract was applied to 18% of the total area treated by 'other products' and 39% of the total weight of 'other products'. Products containing boron, magnesium, phosphorus, potassium and zinc were also applied to top fruit crops.

'OTHER' TOP FRUIT CROPS

'Other' top fruit represented 2% of the total area of top fruit grown with dessert apples being the principal other top fruit grown in Northern Ireland. Other top fruit recorded included plums, pears and culinary apples. There may be other small holdings of top fruit, which were not recorded on the Northern Ireland Agricultural Census (2019) and therefore not selected for this survey. This made it extremely difficult to estimate the amount of 'other' top fruit being grown. On average, pesticide usage trends for dessert apples and pears were similar to those associated with Bramley apple crops. Pesticide usage on 'other' top fruit with reasons for treatment is shown in Table 14. A comparison of the grown area of 'other' top fruit is shown in Table 16.

COMPARISON WITH PREVIOUS SURVEYS

Comparative information on pesticide usage on top fruit crops grown in Northern Ireland during 1992 to 2020 is included in Tables 16, 17a, 17b, 18, 20a, 20b and Figures 6 to 14.

Area of top fruit crops grown (Table 16)

The number of orchard holdings in Northern Ireland remained similar to 2018, only decreasing by 2%. The area of top fruit grown in Northern Ireland in 2020 decreased by 9% during the period, with the area of Bramley apple crops decreasing to 1,336 ha. This would suggest that some consolidation has taken place within the industry since 2018. The survey also recorded a 36% decrease in the overall area of 'other' top fruit crops grown (including dessert apple, pear and plum orchards), from 41 ha to 26 ha. As in all previous surveys, a majority of the total top fruit area in Northern Ireland was associated with Bramley apple production (98%).

Comparison of pesticide usage (Tables 17a, 17b 18, Figures 6 to 13)

There was a 10% decrease in the total area of pesticide application to top fruit crops between 2018 and 2020. The weight of pesticides applied in 2020 decreased by 18% when compared to 2018. This was due to an overall reduction in pesticide application across all pesticide types. (Figures 8 & 9).

The area of top fruit crops treated with fungicides decreased by 8% since 2018, and the weight of fungicides applied decreased by 20%. Herbicide applications decreased by 14% for the total area treated but the total weight of active ingredients applied increased by 6%.

The area of top fruit crops treated with insecticide/acaricide decreased by 28% and the weight of active ingredients applied decreased by 59% since 2018 (Figures 10 & 11). Pyrethroid applications decreased by 42% in area treated and 24% in quantity applied. The neonicotinoid active ingredient thiacloprid accounted for 4% of the total insecticide treated area and 1% of quantity applied. No insecticides containing carbamate or organophosphate active ingredients were recorded in 2020. Other insecticides included moulting accelerators, chordotonal organ modulators and diamides.

An estimated 933 spray hectares were treated with growth regulators in 2020, a decrease of 27% since 2018. The weight of growth regulators applied increased by 10% between 2018 and 2020.

The active ingredients most extensively used in 2020 are shown in Table 18, which also provides the trend in application from 1992 -2020.

Storage of top fruit crops (Tables 19, 20a & 20b, Figures 14 to 16)

An estimated 16,023 tonnes of Bramley apples were stored in 2020, of which 84% (13,390) tonnes) received a post-harvest treatment. There was a 10% increase in the weight of apples stored in 2020 when compared with 2018 (Figure 15).

Five different storage methods were identified during this survey. Unscrubbed controlled atmosphere stores, representing 69% of stored apples, are refrigerated un-vented stores, which use a method to remove and expel carbon dioxide and other gasses from the atmosphere. Scrubbed controlled atmosphere stores, which are refrigerated and use vents to reduce carbon dioxide levels, accounted for 23% of stored apples. Cold/refrigerated stores, which have no modified atmosphere and use cooled, forced air ventilation, accounted for 4% of stored apples. A further 4% of stored apples were in carbon dioxide stores. Less than 1% were stored in unventilated barns.

The ethylene inhibitor, 1-methylcyclopropene, was the only product recorded in use on stored apples, accounting for all stored apples treated. Due to its application method, it was impossible to calculate the weight of active ingredient applied.

Tonnes treated and the active ingredient recorded in use on stored apples are shown in Tables 19, 20a and 20b.

ACKNOWLEDGEMENTS

We, the authors, wish to thank all of the growers who participated in this survey, without whose co-operation, the completion of this report would not have been possible. We are also grateful for the invaluable assistance of Ms Ciara Isaac and Mr Sean Lennon who worked tirelessly on key aspects of this report.

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FIGURES

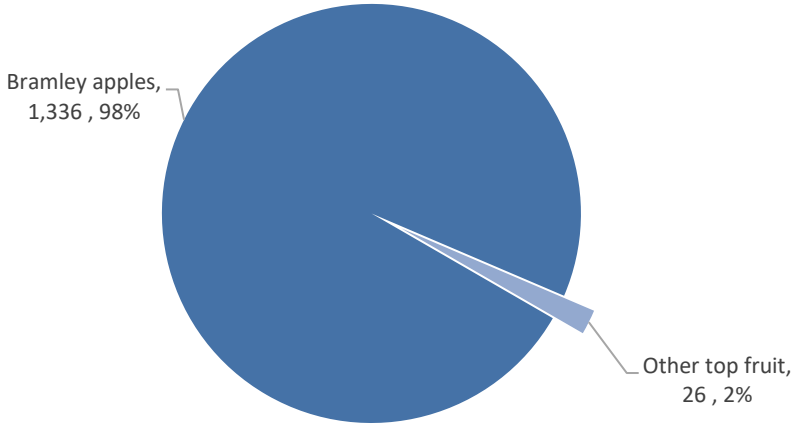


Figure 1 **Total area of top fruit production (ha) and proportion (%) in Northern Ireland, 2020.**

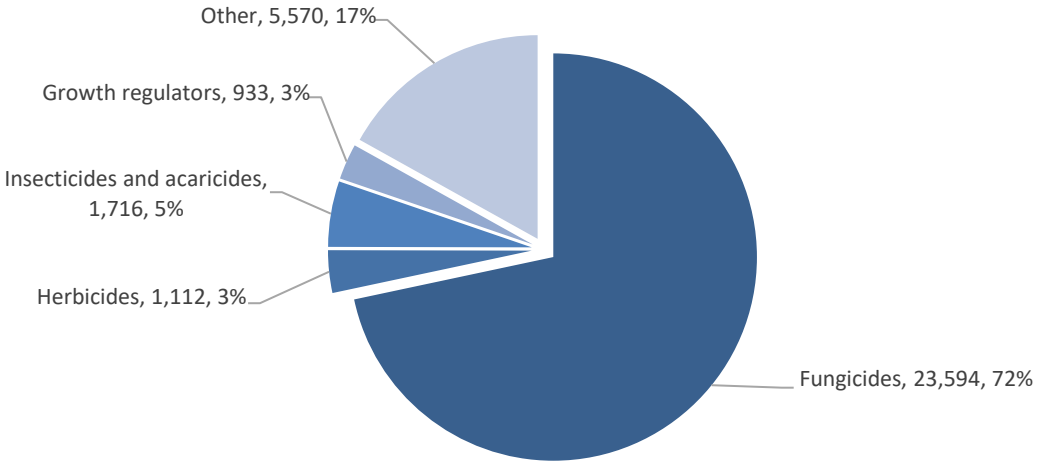


Figure 2 **Pesticide type by area treated (spha) and proportion (%) applied to top fruit crops in Northern Ireland, 2020.**

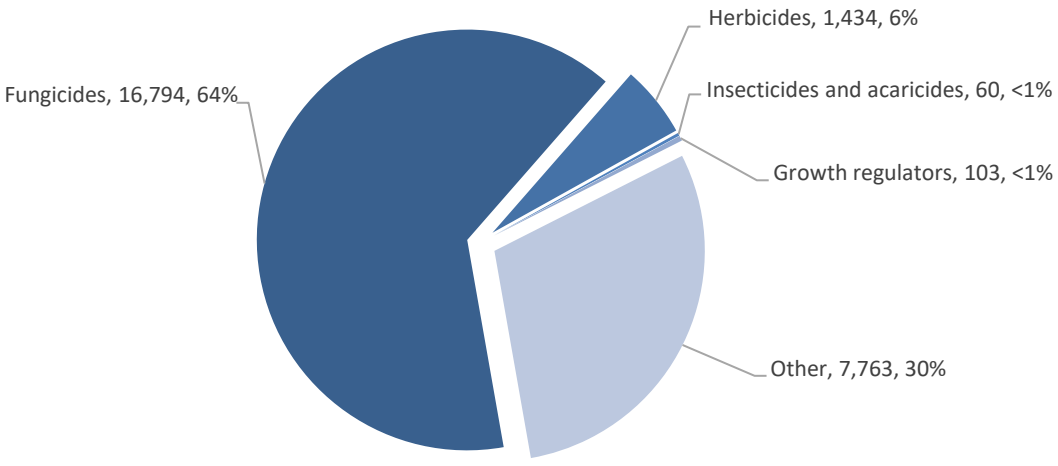
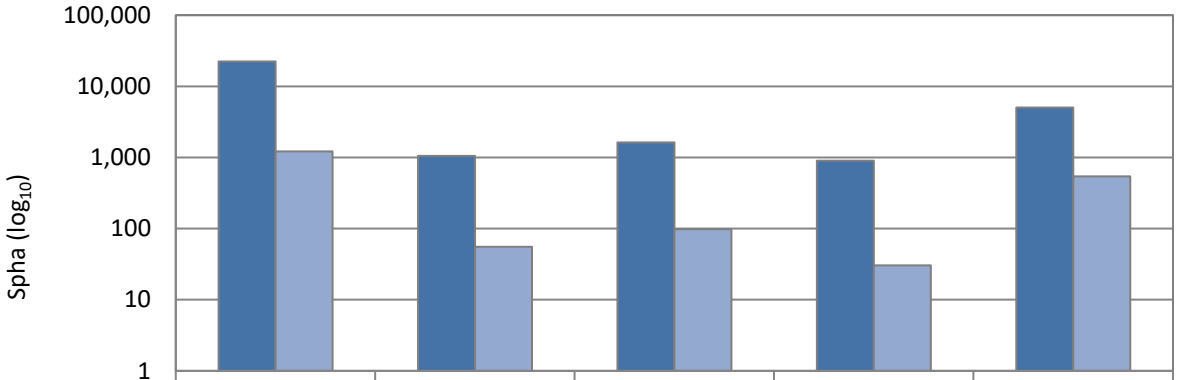
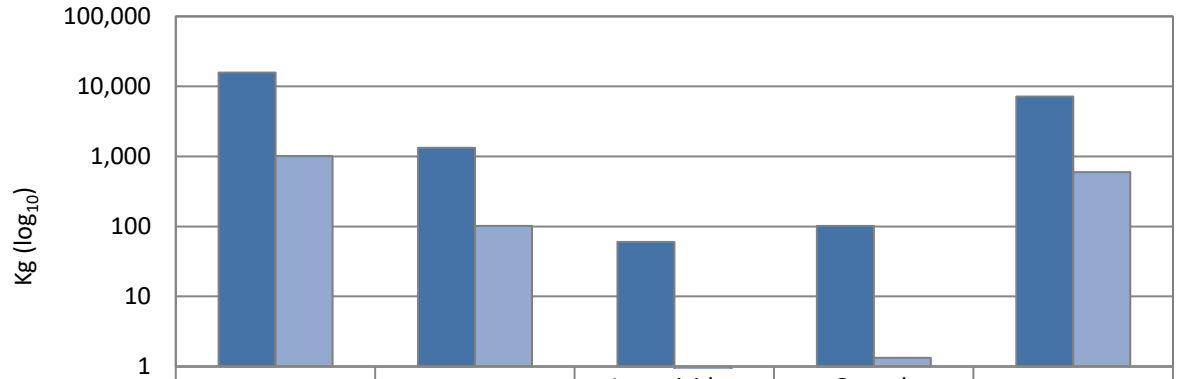


Figure 3 **Pesticide type by weight applied (kg) and proportion (%) applied to top fruit crops in Northern Ireland, 2020.**



	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other
Armagh	22,374	1,056	1,617	903	5,029
All other counties	1,220	55	98	30	541

Figure 4 **Area (spha (log_{10})) of top fruit crops treated with each pesticide type in the county regions of Northern Ireland, 2020.**



	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other
Armagh	15,782	1,332	60	101	7,165
All other counties	1,013	101	0.3	1	598

Figure 5 **Quantity (kg (log_{10})) of each pesticide type applied to top fruit crops in the county regions of Northern Ireland, 2020.**

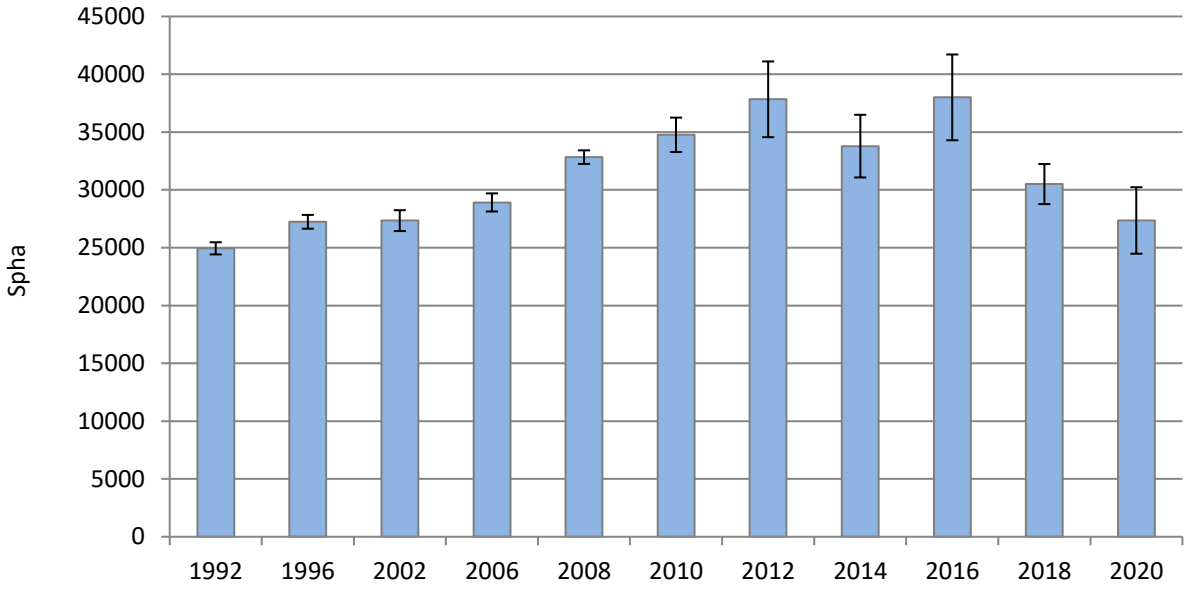


Figure 6 **Comparison of pesticide usage* on top fruit crops by area treated (spha) in Northern Ireland, 1992-2020** (*Bars are Standard Error*).

*** Figures include fungicides, herbicides, insecticides and acaricides and growth regulators. "Other products" not included.**

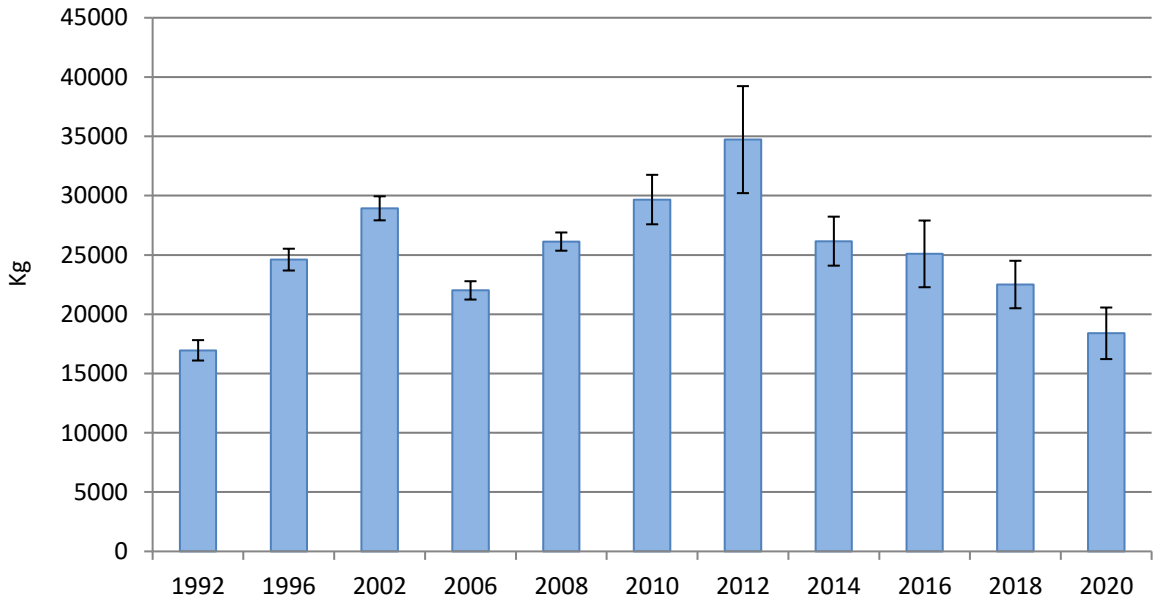


Figure 7 **Comparison of pesticide usage* on top fruit crops by total weight applied (kg) in Northern Ireland, 1992-2020** (*Bars are Standard Error*).

*** Figures include fungicides, herbicides, insecticides and acaricides and growth regulators. "Other products" not included.**

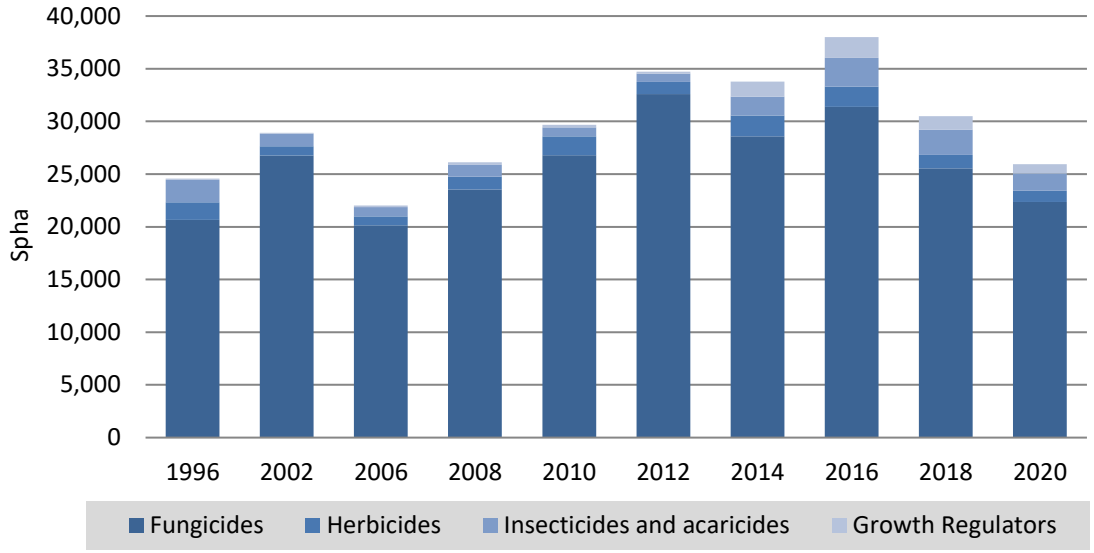


Figure 8 **Comparison of area treated (spha) with different pesticide groups in Northern Ireland, 1992-2020.**

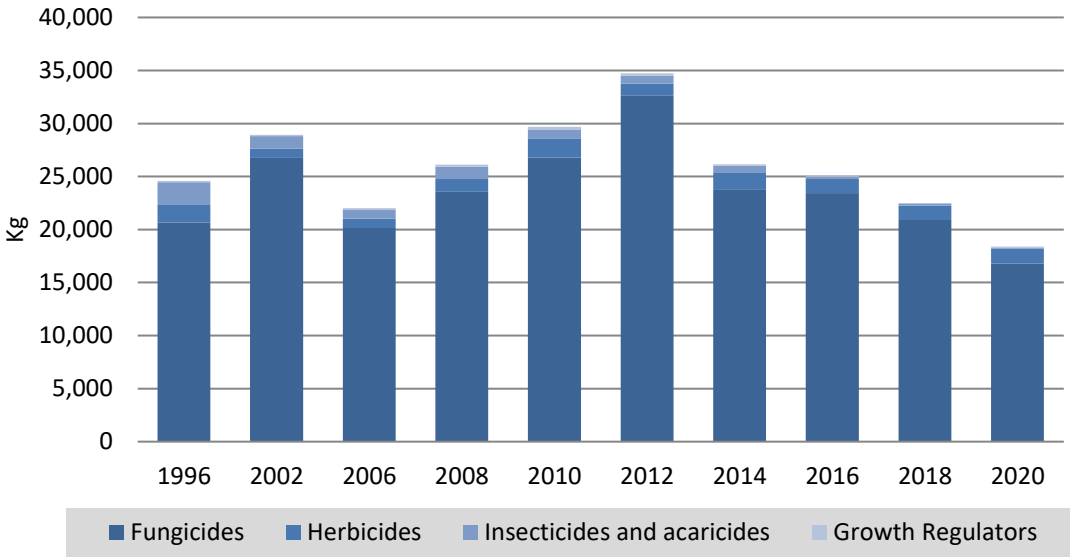


Figure 9 **Comparison of quantity (kg) of different pesticide groups applied to top fruit crops in Northern Ireland, 1992-2020.**

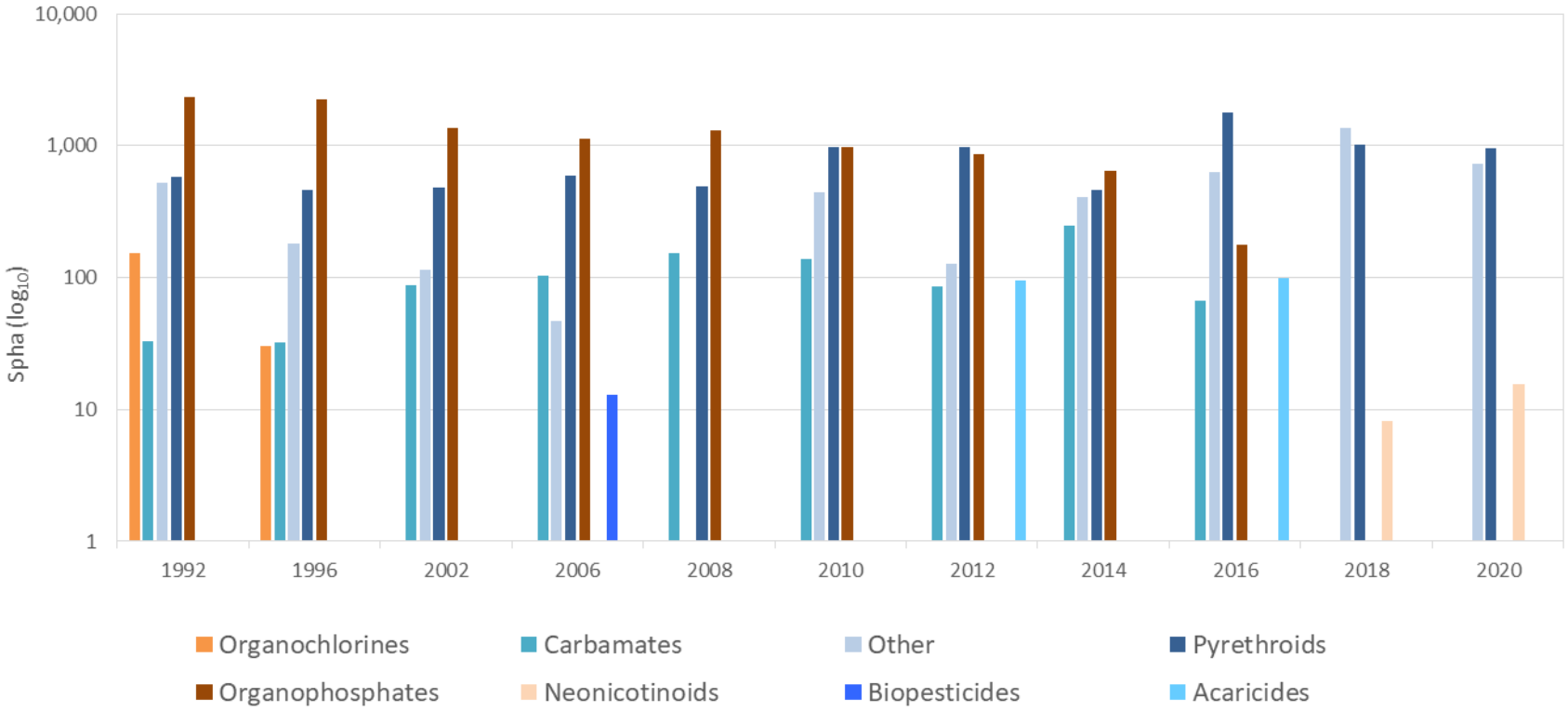


Figure 10 **Comparison of area (spha (log_{10})) of top fruit crops treated with different insecticide types* in Northern Ireland, 1992-2020.**

Acaricides previously included with 'Other' from 1992-2010

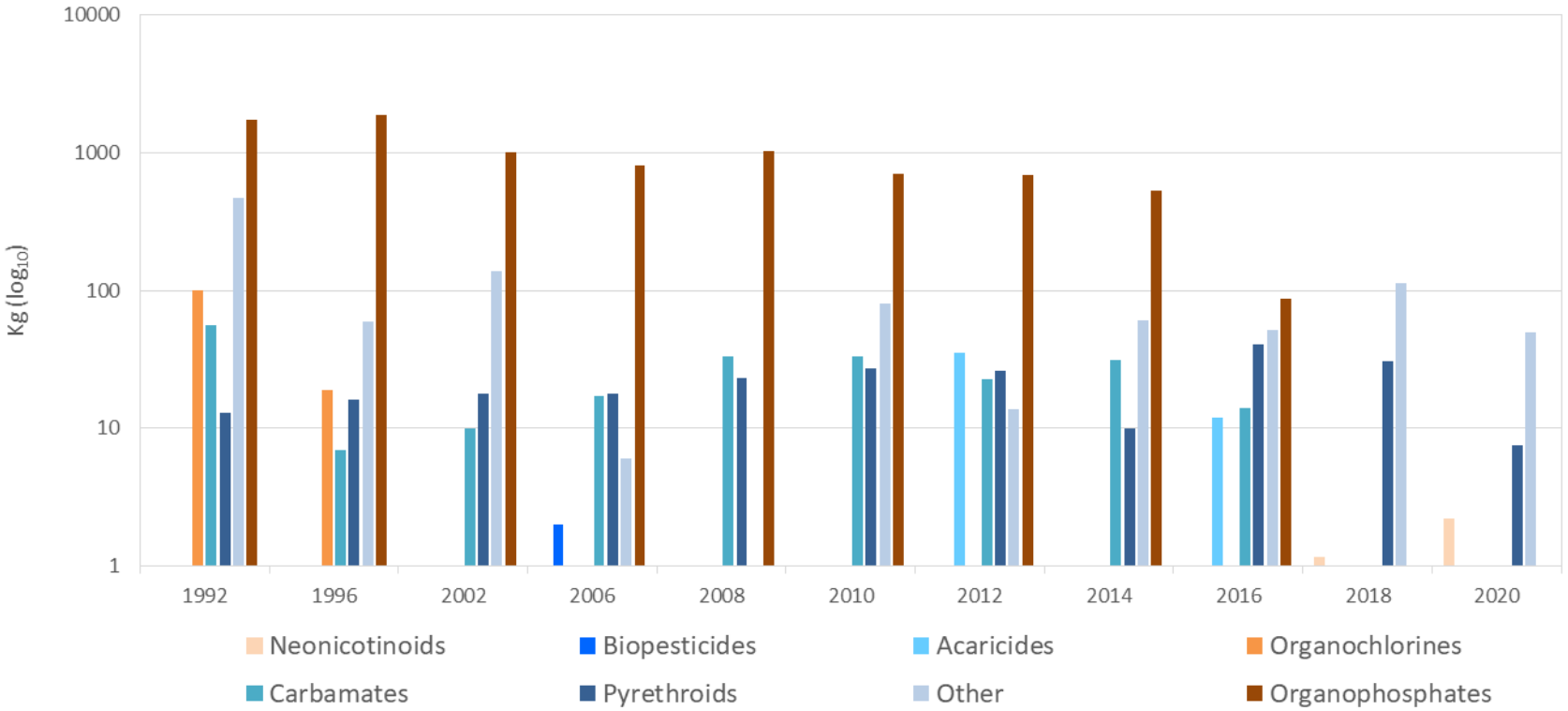


Figure 11 **Comparison of quantity (kg (log_{10})) of different insecticide types* applied to top fruit crops in Northern Ireland, 1992-2020.**

Acaricides previously included with 'Other' from 1992-2010

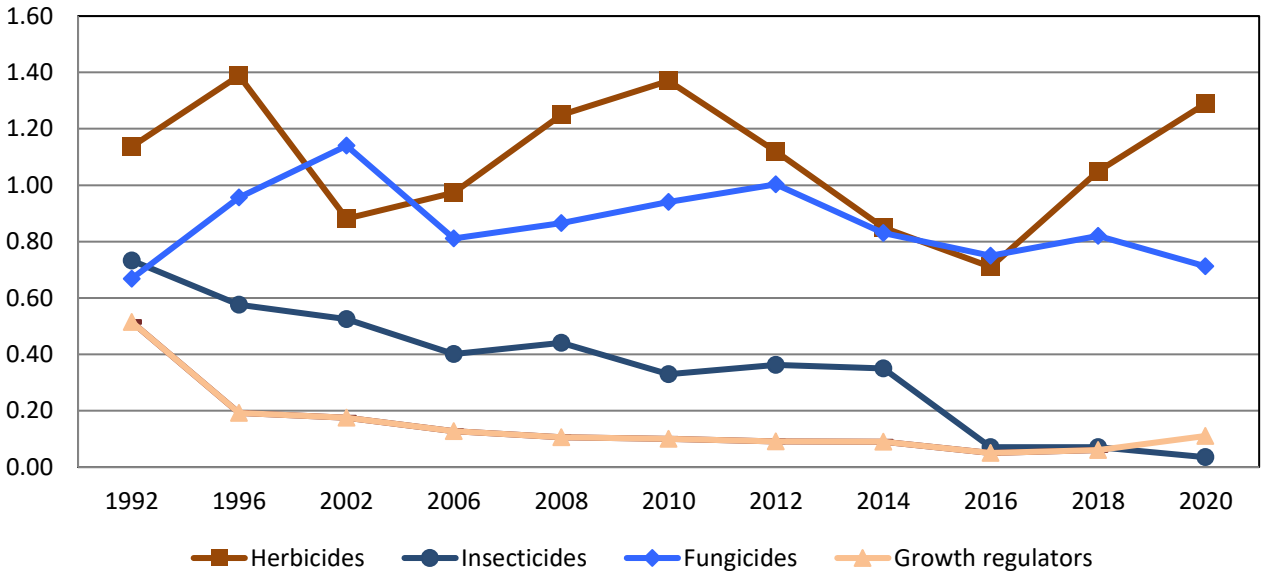


Figure 12 **Application rates (kg/spha) for each pesticide type used on top fruit crops in Northern Ireland, 1992-2020.**

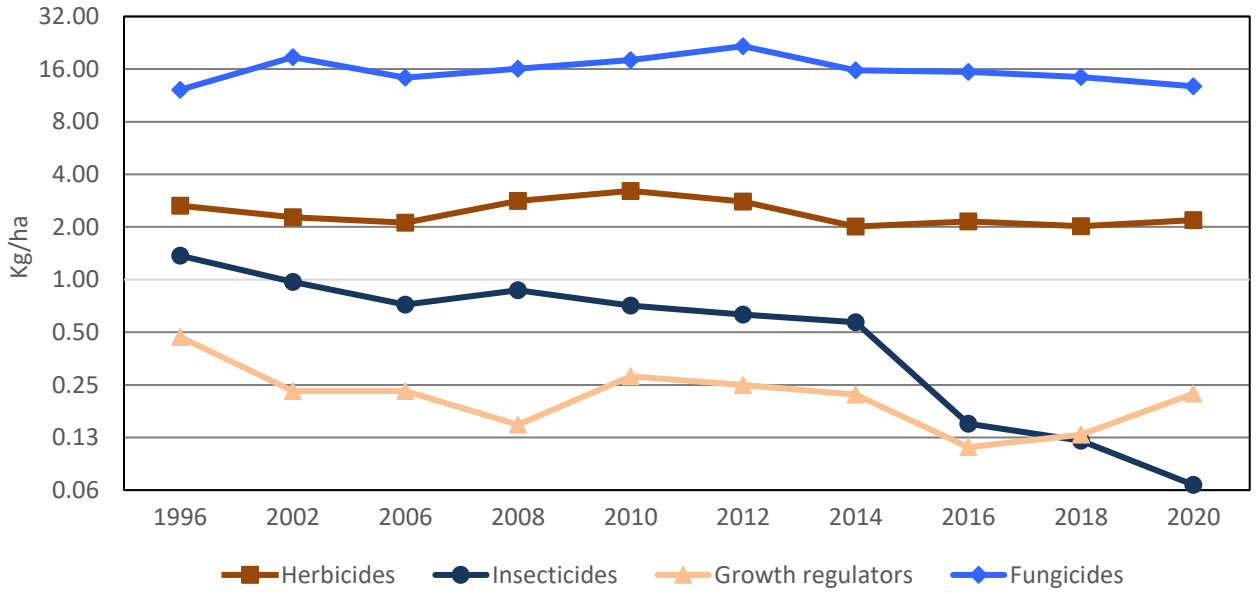


Figure 13 **Quantity of fungicides, herbicides, insecticides and growth regulators applied per basic hectare of top fruit crops (kg/ha) in Northern Ireland, 1996-2020.**

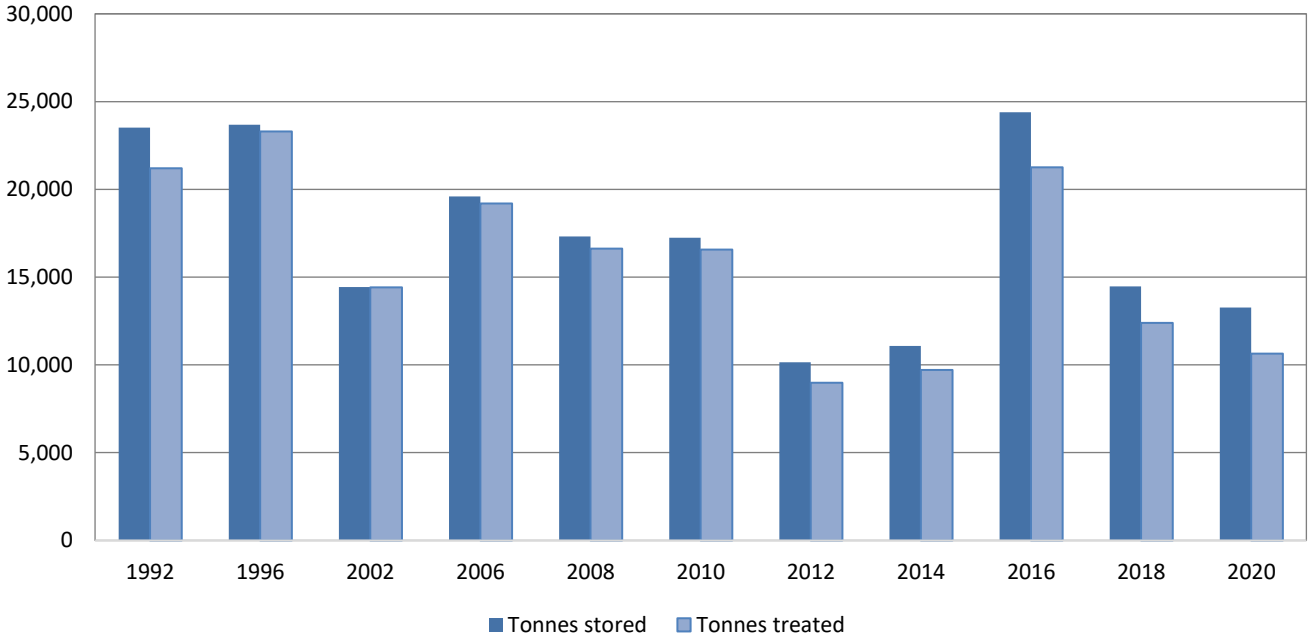


Figure 14 **Quantity of Bramley apples stored (tonnes) and quantity receiving a post-harvest treatment (tonnes) in Northern Ireland, 1992-2020.**

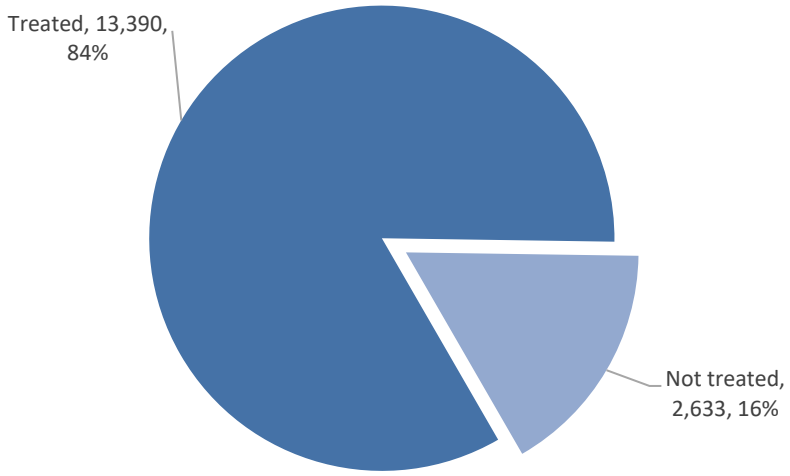


Figure 15 **Quantity (tonnes) and proportion (%) of stored Bramley apples receiving post-harvest treatments in Northern Ireland, 2020.**

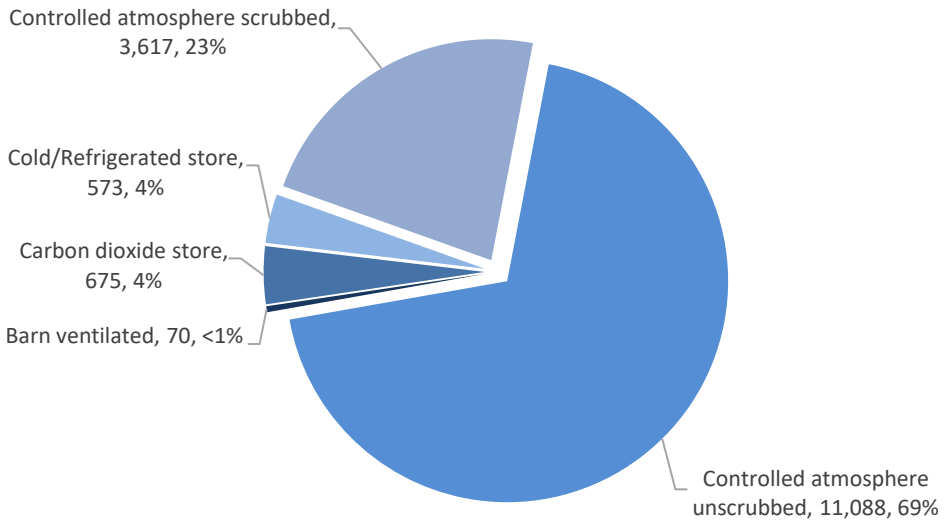


Figure 16 **Storage methods used for Bramley apples showing quantity (tonnes) and proportion (%) in Northern Ireland, 2020.**

PESTICIDE USAGE ON BRAMLEY APPLE CROPS

- Total area grown: 1,336 hectares
- Basic area treated: 1,336 hectares
- Total pesticide-treated area: 26,938 spray hectares
- Weight of active substances applied: 18,144 kilogrammes
- 22 different fungicide substances, 8 insecticide/acaricides, 5 herbicides and 2 growth regulators were applied to Bramley apple crops

Fungicides – Bramley apples

- Basic area treated: 1,290 hectares
- Total fungicide treated area: 23,222 spray hectares
- Weight of active substances applied: 16,566 kilogrammes
- Fungicides accounted for 86% of total area of Bramley apples treated and 91% of total weight applied
- The most commonly used fungicides were captan, dodine, pyrimethanil, mancozeb, and boscalid/pyraclostrobin being applied to 14,277 spray hectares of Bramley apple crops

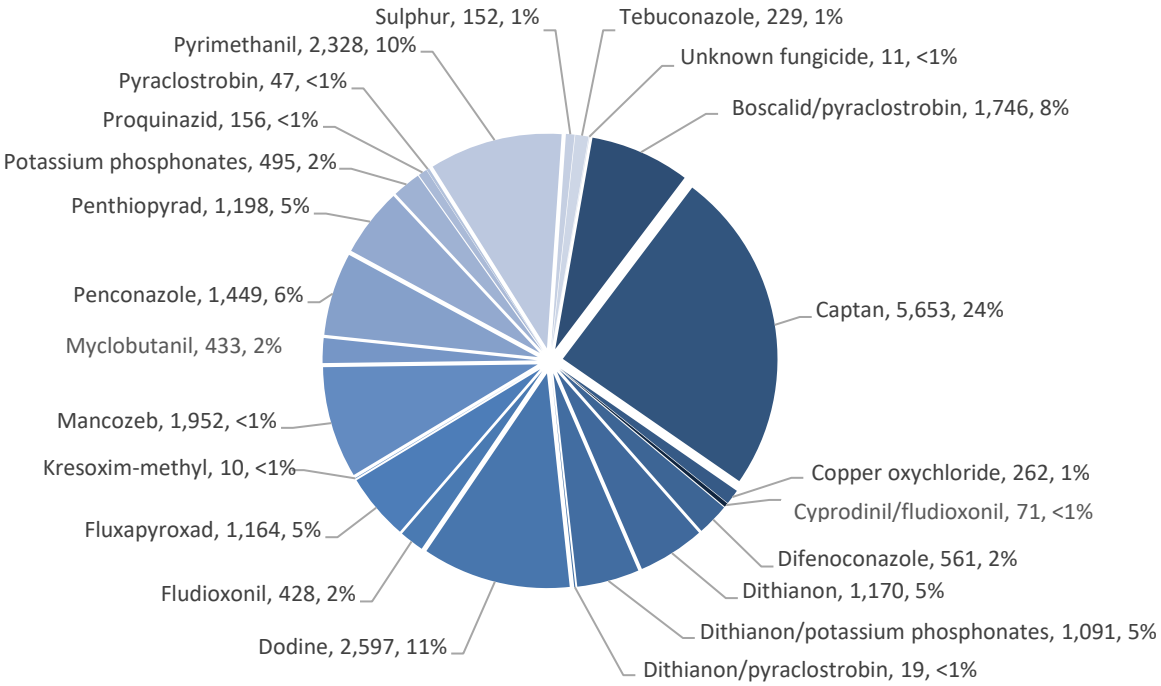


Figure 17 **Fungicide active ingredients applied to Bramley apple crops showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

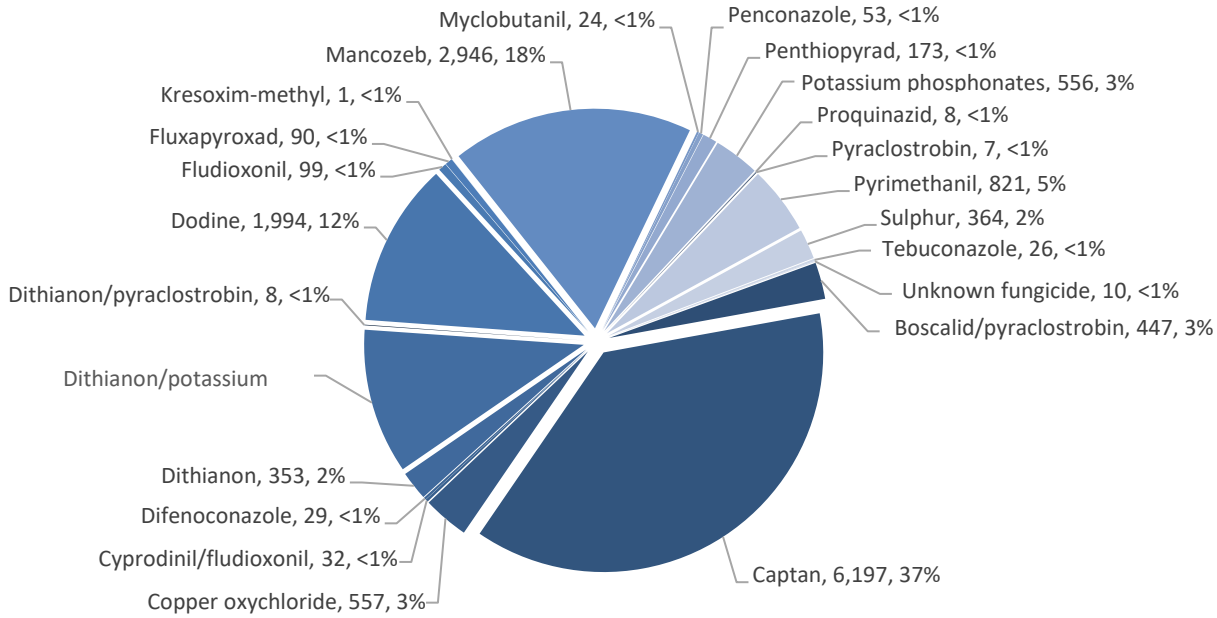


Figure 18 **Fungicide active ingredients applied to Bramley apple crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020.**

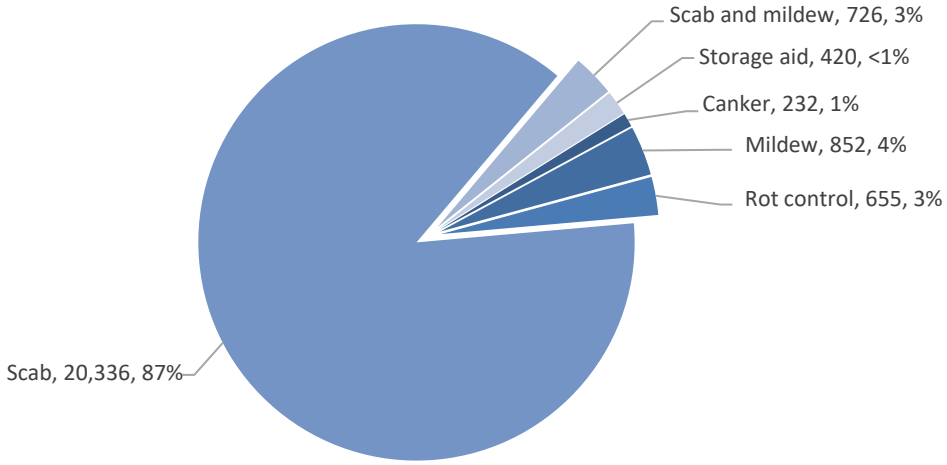


Figure 19 **Bramley apples: Reasons for fungicide treatment showing area treated (spha) and proportion (%), 2020.**

Herbicides –Bramley apples

- Basic area treated: 646 hectares
- Total herbicide treated area: 1,088 spray hectares
- Weight of active substances applied: 1,415 kilogrammes
- Herbicides accounted for 4% of the total area of Bramley apples treated and 8% of the total weight applied
- The most frequently used herbicide was glyphosate, applied to 493 spray hectares of Bramley orchard floor areas, accounting for 41% of the total weight of herbicides applied

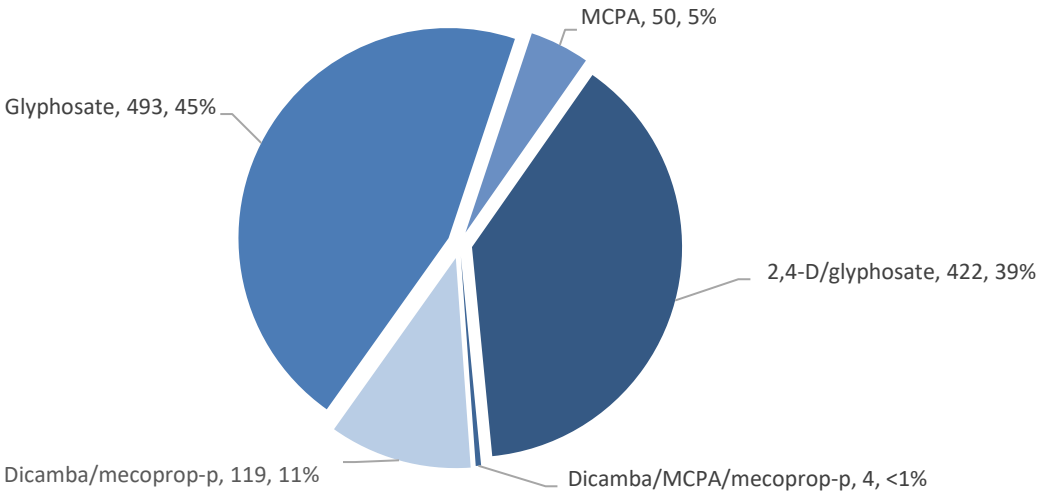


Figure 20 **Herbicide active ingredients applied to Bramley apple crops showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

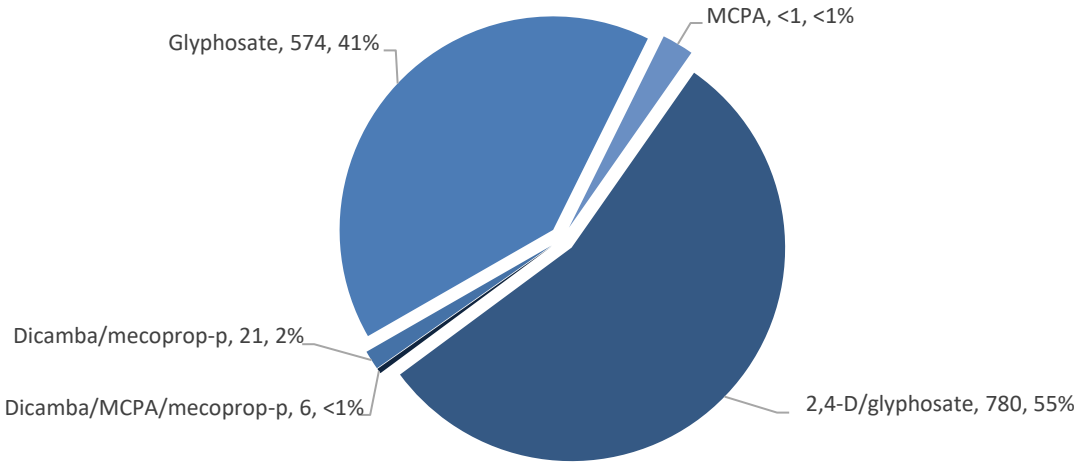


Figure 21 **Herbicide active ingredients applied to Bramley apple crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020.**

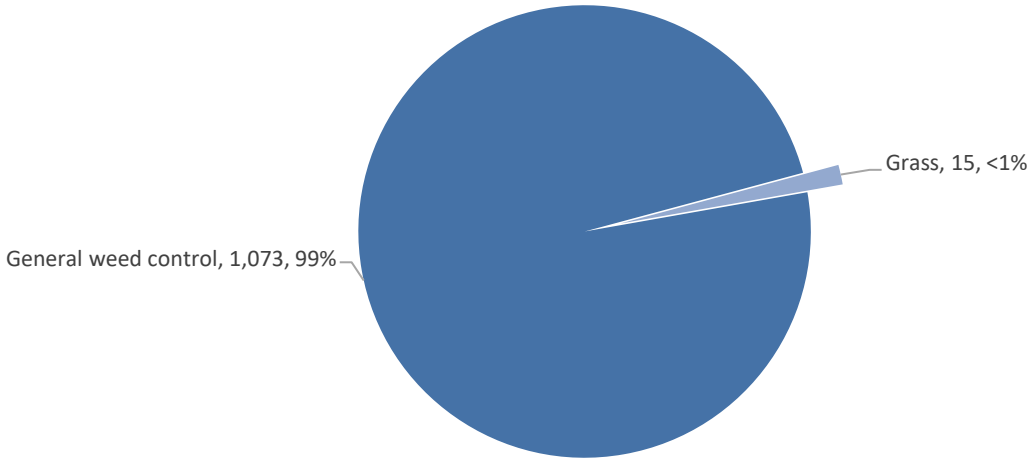


Figure 22 **Bramley apples: Reasons for herbicide treatment, showing area treated (spha) and proportion (%), 2020.**

Insecticide/acaricides – Bramley apples

- Basic area treated: 883 hectares
- Total area treated: 1,694 spray hectares
- Weight of active substances applied: 60 kilogrammes
- Insecticide/acaricides accounted for 6% of the total area treated and less than 1% of the total weight applied
- The most commonly used insecticides/acaracides used were deltamethrin, chlorantraniliprole, methoxyfenozide and cypermethrin being applied to 1,533 spray hectares of Bramley apple crops.

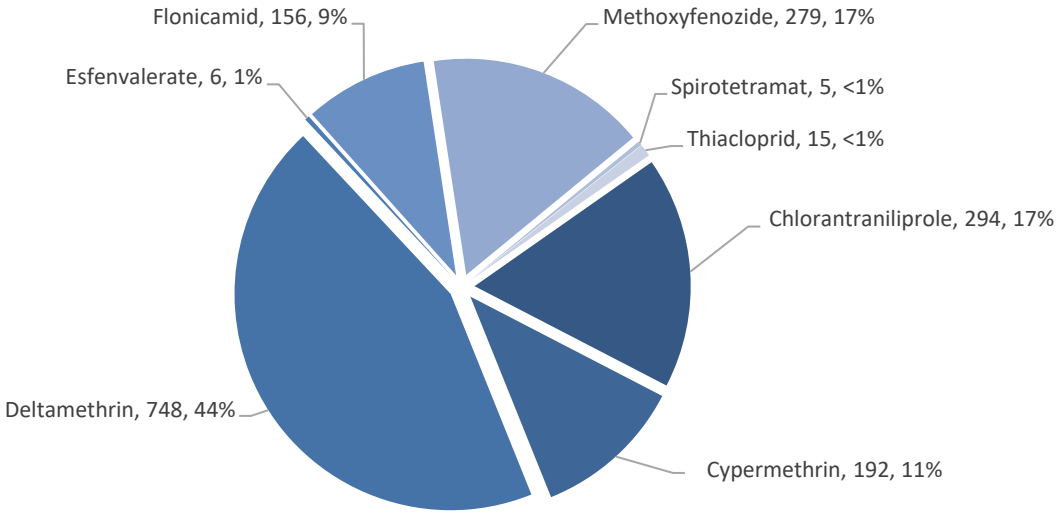


Figure 23 **Insecticide/acaricide active ingredients applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

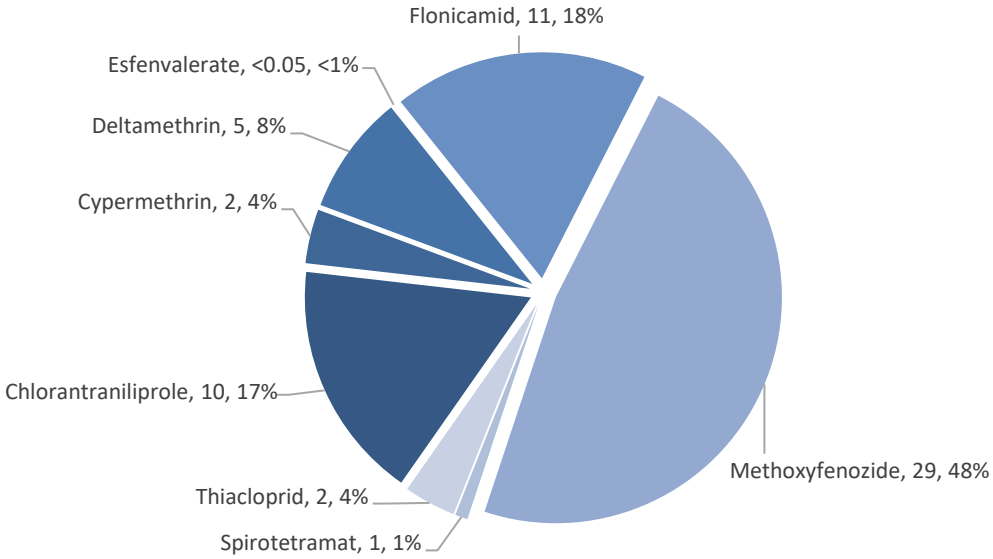


Figure 24 **Insecticide/acaricide active ingredients applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020.**

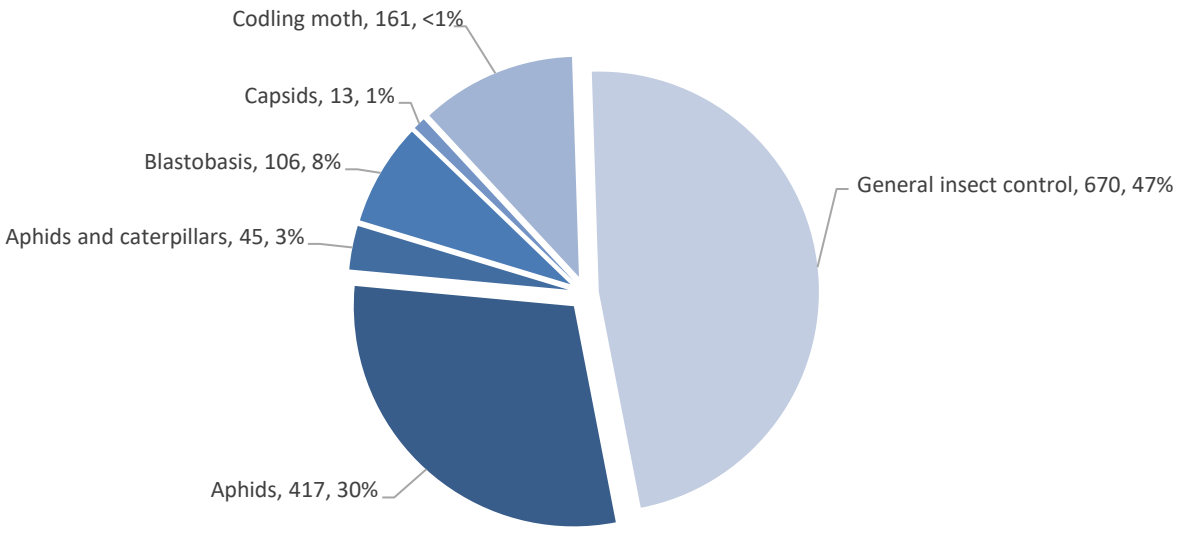


Figure 25 **Bramley apples: Reasons for insecticide/acaricide treatment showing area treated (spha) and proportion (%), 2020.**

Growth regulators – Bramley apples

- Basic area treated: 461 hectares
- Total growth regulator treated area: 933 spray hectares
- Weight of active substances applied: 103 kilogrammes
- Growth regulators accounted for 3% of the total area of Bramley apples treated and less than 1% of the total weight applied
- Reason for all applications was for growth regulation

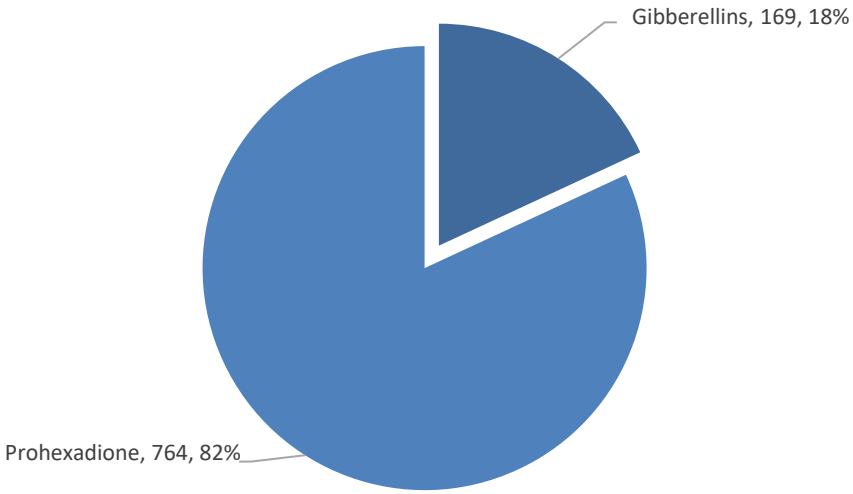


Figure 26 **Growth regulator active ingredients applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

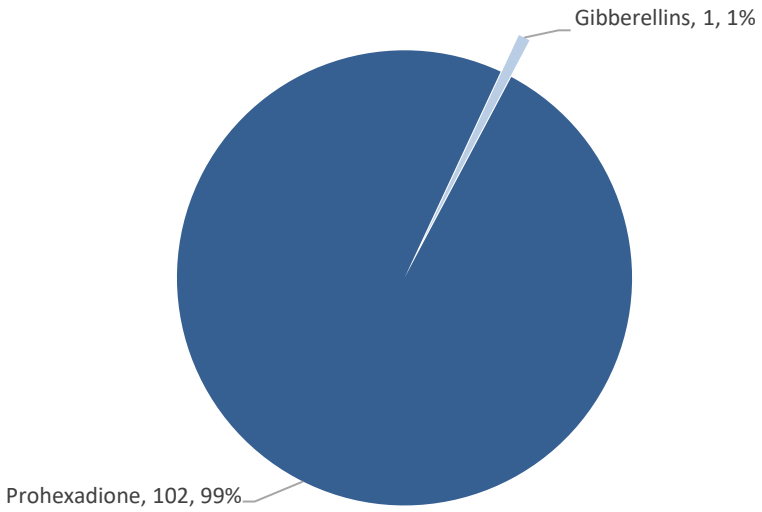


Figure 27 **Growth regulator active ingredients applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020.**

'Other products' – Bramley apples

- Basic area treated: 728 hectares
- Total area treated: 5,389 spray hectares
- Weight of 'other products' applied: 7,581 kilogrammes

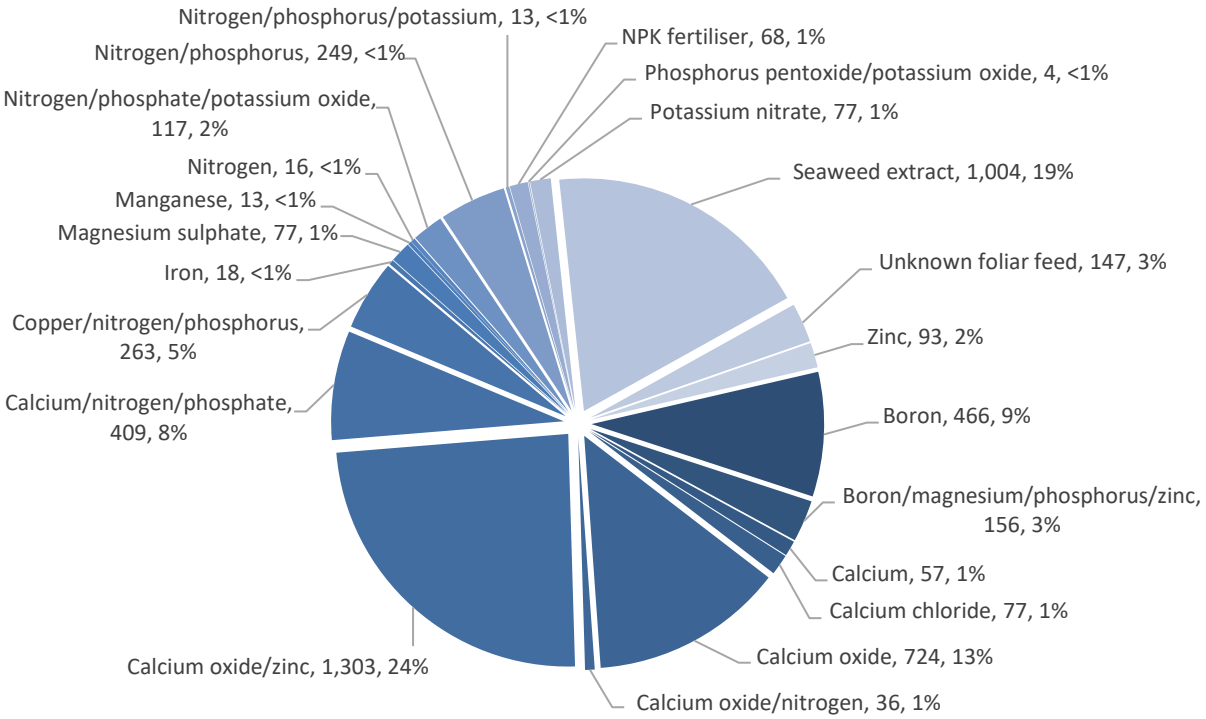


Figure 28 **'Other products'* applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

'Other products' included foliar feeds, trace elements and calcium-based products of which the majority were used to treat potential nutritional disorders.

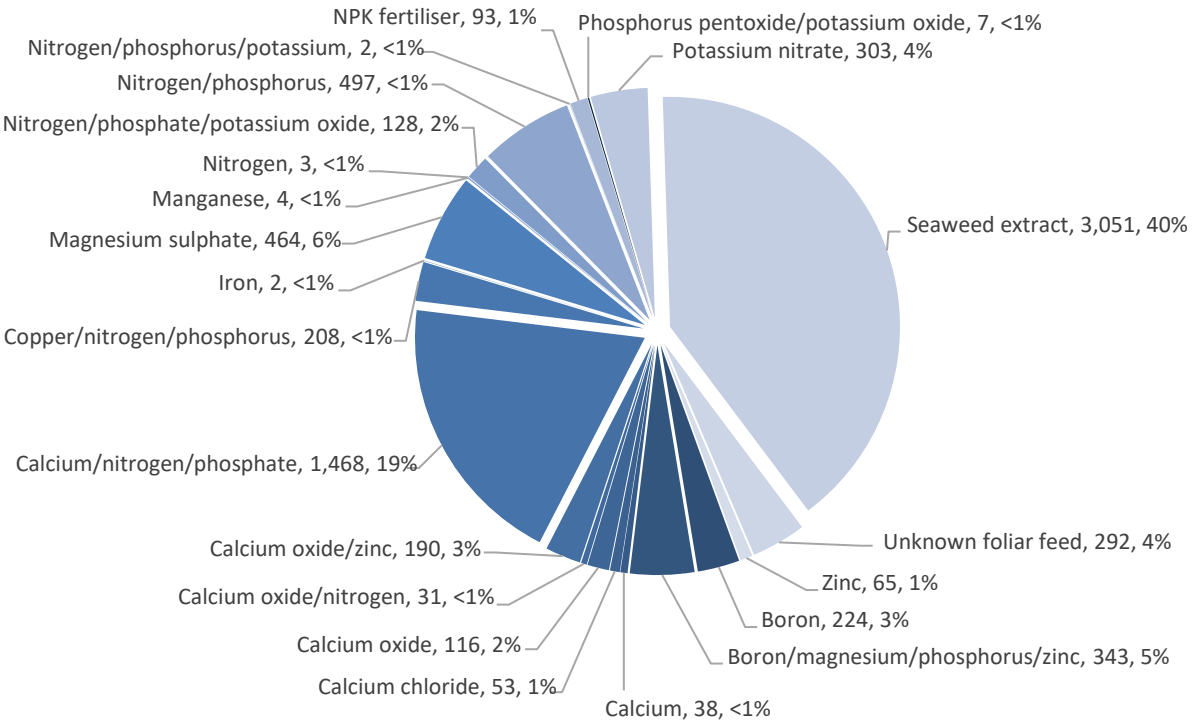


Figure 29 **'Other products'* applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020.**

'Other products' included foliar feeds, trace elements and calcium-based products of which the majority were used to treat potential nutritional disorders.

PESTICIDE USAGE ON 'OTHER' TOP FRUIT CROPS

- Total basic area treated: 26 hectares
- Total pesticide-treated area: 416 spray hectares
- Total weight of active substances applied: 247 kilogrammes
- Fungicides accounted for 89% of the total area of other top fruit treated and 92% of weight applied
- No growth regulators were applied to 'other' top fruit crops
- A further 182 kilogrammes of 'other products' were applied to 181 spray hectares.

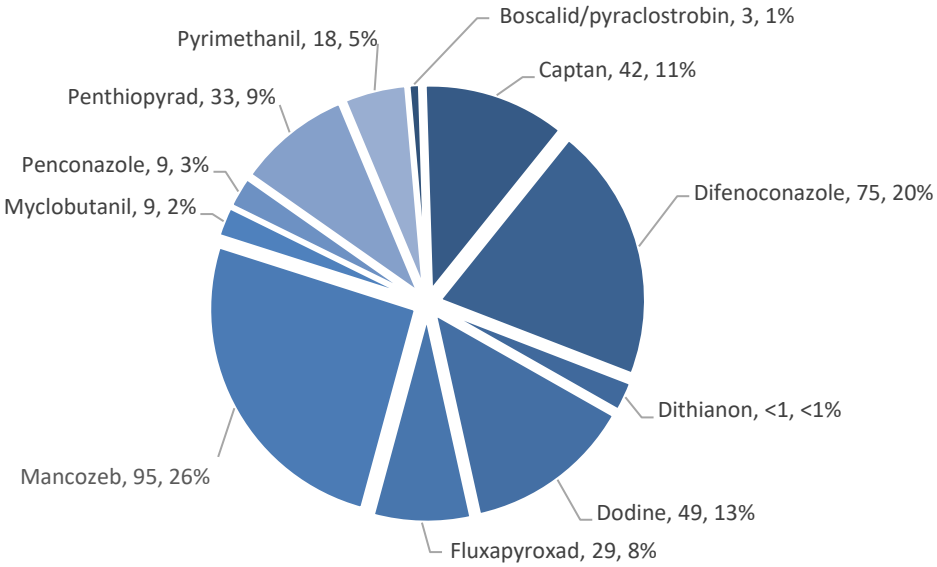


Figure 30 **Fungicide active ingredients applied to 'other' crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2020.**

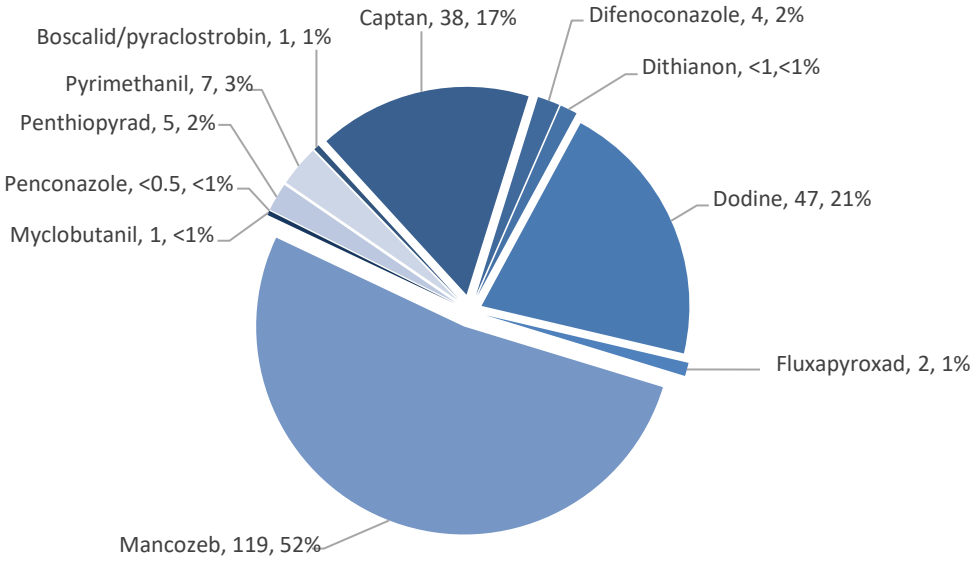


Figure 31 **Fungicide active ingredients applied to 'other' crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2020**.**

*****A further 45 spha. Of "Other" top fruit crops were treated with herbicides and insecticides (see Tables 9, 10 and 14).***

TABLES

Table 1 **The total number of holdings in strata (A) and the number of holdings surveyed (B) from each size group in Northern Ireland, 2020.**

County	Size Group (hectares)													
	<2		2<4		4<6		6<9		9<14		14+		Total	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Armagh	34	**5**	27	**10**	26	**10**	15	**9**	18	**14**	30	**8**	150	**56**
All other counties	46	**1**	2	**0**	3	**2**	0	**0**	0	**0**	1	**1**	52	**4**
Northern Ireland	80	**6**	29	**10**	29	**12**	15	**9**	18	**14**	31	**9**	202	**60**

Table 2 **Estimated grown area of crops (ha), total surveyed area of crops (ha) and proportion (%) of the total area of top fruit crops surveyed in Northern Ireland, 2020.**

Crop type	Grown area	Surveyed area	Proportion of crop surveyed
Bramely apples	1,336	513	38%
Other top fruit	25	14	56%
All crops	**1,362**	**527**	**N/A**

Table 3 **Estimated area (ha) of top fruit crops grown regionally in Northern Ireland, 2020.**

	County		
Crop type	**Armagh**	**All other counties**	**Northern Ireland**
Bramley apples	1,219	117	1,336
Other top fruit	26	0	26
All crops	**1,245**	**117**	**1,362**

Table 4 **Estimated area (spha) of top fruit crops receiving treatments, categorised by pesticide type and region in Northern Ireland, 2020.**

	Pesticide Type					
County	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other	Northern Ireland
Armagh	22,374	1,056	1,617	903	5,029	30,980
All other counties	1,220	55	98	30	541	1,945
Total	**23,594**	**1,112**	**1,716**	**933**	**5,570**	**32,925**

Table 5 **Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and region in Northern Ireland, 2020.**

County	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other	Northern Ireland
Armagh	15,782	1,332	60	101	7,165	24,440
All other counties	1,013	101	<1	1	598	1,714
All pesticides	**16,794**	**1,434**	**60**	**103**	**7,763**	**26,154**

Table 6 **Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and crop type in Northern Ireland, 2020.**

	Pesticide Type					
Crop Type	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other	Total quantity (kg)
Bramley apples	16,566	1,415	60	103	7,581	25,725
Other top fruit	228	19	<1	0	182	430
All Crops	**16,794**	**1,434**	**60**	**103**	**7,763**	**26,154**

Table 7 **The basic area (ha) and the total area (spha) of top fruit crops treated with each pesticide type in Northern Ireland, 2020.**

Crop Type	Pesticide Type											
	Fungicides		Herbicides		Insecticides and acaricides		Growth regulators		Other products		All pesticides	
	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)
Bramley apples	1,290	23,222	646	1,088	883	1,694	461	933	728	5,389	1,336	32,327
Other top fruit	24	372	11	23	17	21	0	0	13	181	26	597
All Crops	**1,314**	**23,594**	**656**	**1,112**	**899**	**1,716**	**461**	**933**	**741**	**5,570**	**1,362**	**32,925**

Table 8 **Number of spray applications by pesticide type, applied to top fruit crops in Northern Ireland, 2020: (A) The mean number of spray applications and (B) the mean number of applications accounting for tank mixes.**

Crop Type	*Pesticide Type*											
	Fungicides		Herbicides		Insecticides and acaricides		Growth regulators		Other products		All crops	
	A	B	A	B	A	B	A	B	A	B	A	B
Bramley apples	16.9	12.5	1.6	1.3	1.8	1.8	1.7	1.7	7.3	5.3	6.9	5.3
Other top fruit	14.8	9.2	2.2	1.9	1.7	1.7	0.0	0.0	7.0	4.3	6.7	4.4
All crops average	**16.8**	**12.3**	**1.7**	**1.4**	**1.8**	**1.8**	**1.7**	**1.7**	**7.3**	**5.3**	**6.9**	**5.3**

Table 9 **Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2020.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Fungicides			
Boscalid/pyraclostrobin	1,746	3	1,750
Captan	5,653	42	5,695
Copper oxychloride	262	.	262
Cyprodinil/fludioxonil	71	.	71
Difenoconazole	561	75	635
Dithianon	1,170	9	1,178
Dithianon/potassium phosphonates	1,091	.	1,091
Dithianon/pyraclostrobin	19	.	19
Dodine	2,597	49	2,647
Fludioxonil	428	.	428
Fluxapyroxad	1,164	29	1,192
Kresoxim-methyl	10	.	10
Mancozeb	1,952	95	2,048
Myclobutanil	433	9	442
Penconazole	1,449	9	1,458
Penthiopyrad	1,198	33	1,232
Potassium phosphonates	495	.	495
Proquinazid	156	.	156
Pyraclostrobin	47	.	47
Pyrimethanil	2,328	18	2,346
Sulphur	152	.	152
Tebuconazole	229	.	229
Unknown fungicide	11	.	11
All fungicides	**23,222**	**372**	**23,594**
Growth Regulators			
Gibberellins	169	.	169
Prohexadione	764	.	764
All growth regulators	**933**	**.**	**933**
Herbicides			
2,4-D/glyphosate	422	.	422
Dicamba/MCPA/mecoprop-p	4	3	8
Dicamba/mecoprop-p	119	.	119
Glyphosate	493	17	509
MCPA	50	3	53
All herbicides	**1,088**	**23**	**1,112**

Table 9 (cont) **Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2020.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Insecticides and acaracides			
Chlorantraniliprole	294	4	298
Cypermethrin	192	.	192
Deltamethrin	748	17	765
Esfenvalerate	6	.	6
Flonicamid	156	.	156
Methoxyfenozide	279	.	279
Spirotetramat	5	.	5
Thiacloprid	15	.	15
All insecticides and acaracides	**1,694**	**21**	**1,716**
Others			
Boron	466	.	466
Boron/magnesium/phosphorus/zinc	156	.	156
Calcium	57	.	57
Calcium chloride	77	.	77
Calcium oxide	724	.	724
Calcium oxide/nitrogen	36	.	36
Calcium oxide/zinc	1,303	.	1,303
Calcium/nitrogen/phosphate	409	54	463
Copper/nitrogen/phosphorus	263	.	263
Iron	18	.	18
Magnesium sulphate	77	.	77
Manganese	13	.	13
Nitrogen	16	93	109
Nitrogen/phosphate/potassium oxide	117	.	117
Nitrogen/phosphorus	249	.	249
Nitrogen/phosphorus/potassium	13	.	13
NPK fertiliser	68	.	68
Phosphorus pentoxide/potassium oxide	4	30	34
Potassium nitrate	77	.	77
Seaweed extract	1,004	4	1,008
Unknown foliar feed	147	.	147
Zinc	93	.	93
All others	**5,389**	**181**	**5,570**
All pesticides	***32,327***	***597***	***32,925***

Table 10 **Estimated quantities (kg) of top fruit crops treated with pesticide formulations in Northern Ireland, 2020.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Fungicides			
Boscalid/pyraclostrobin	447	1	448
Captan	6,197	38	6,235
Copper oxychloride	557	.	557
Cyprodinil/fludioxonil	32	.	32
Difenoconazole	29	4	33
Dithianon	353	3	356
Dithianon/potassium phosphonates	1,770	.	1,770
Dithianon/pyraclostrobin	8	.	8
Dodine	1,994	47	2,041
Fludioxonil	99	.	99
Fluxapyroxad	90	2	93
Kresoxim-methyl	1	.	1
Mancozeb	2,946	119	3,065
Myclobutanil	24	<1	25
Penconazole	53	<0.5	54
Penthiopyrad	173	5	178
Potassium phosphonates	556	.	556
Proquinazid	8	.	8
Pyraclostrobin	7	.	7
Pyrimethanil	821	7	828
Sulphur	364	.	364
Tebuconazole	26	.	26
Unknown fungicide	10	.	10
All fungicides	**16,566**	**228**	**16,794**
Growth Regulators			
Gibberellins	1	.	1
Prohexadione	102	.	102
All growth regulators	**103**	**.**	**103**
Herbicides			
2,4-D/glyphosate	780	.	780
Dicamba/MCPA/mecoprop-p	6	<0.5	6
Dicamba/mecoprop-p	21	.	21
Glyphosate	574	17	592
MCPA	34	1	35
All herbicides	**1,415**	**19**	**1,434**

Table 10 (cont) **Estimated quantities (kg) of top fruit crops treated with pesticide formulations in Northern Ireland, 2020.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Insecticides and acaracides			
Chlorantraniliprole	10	<0.2	10
Cypermethrin	2	.	2
Deltamethrin	5	<0.1	5
Esfenvalerate	<0.05	.	<0.05
Flonicamid	11	.	11
Methoxyfenozide	29	.	29
Spirotetramat	1	.	1
Thiacloprid	2	.	2
All insecticides and acaracides	**60**	**0.22**	**60**
Others			
Boron	224	.	224
Boron/magnesium/phosphorus/zinc	343	.	343
Calcium	38	.	38
Calcium chloride	53	.	53
Calcium oxide	116	.	116
Calcium oxide/nitrogen	31	.	31
Calcium oxide/zinc	190	.	190
Calcium/nitrogen/phosphate	1,468	106	1,574
Copper/nitrogen/phosphorus	208	.	208
Iron	2	.	2
Magnesium sulphate	464	.	464
Manganese	4	.	4
Nitrogen	3	16	19
Nitrogen/phosphate/potassium oxide	128	.	128
Nitrogen/phosphorus	497	.	497
Nitrogen/phosphorus/potassium	2	.	2
NPK fertiliser	93	.	93
Phosphorus pentoxide/potassium oxide	7	51	58
Potassium nitrate	303	.	303
Seaweed extract	3,051	9	3,060
Unknown foliar feed	292	.	292
Zinc	65	.	65
All others	**7,581**	**182**	**7,763**
All pesticides	***25,725***	***430***	***26,154***

Table 11 **The active ingredients* most extensively used on top fruit crops ranked by treated area (spha) in Northern Ireland, 2020.**

No.	Active ingredient	Treated area (sp.ha)
1	Captan	5,695
2	Dodine	2,647
3	Pyrimethanil	2,346
4	Dithianon	2,289
5	Mancozeb	2,048
6	Pyraclostrobin	1,816
7	Boscalid	1,750
8	Potassium phosphonates	1,586
9	Penconazole	1,458
10	Penthiopyrad	1,232
11	Fluxapyroxad	1,192
12	Glyphosate	931
13	Deltamethrin	765
14	Prohexadione	764
15	Difenoconazole	635
16	Fludioxonil	499
17	Myclobutanil	442
18	2,4-D	422
19	Chlorantraniliprole	298
20	Methoxyfenozide	279
21	Copper oxychloride	262
22	Tebuconazole	229
23	Cypermethrin	192
24	Gibberellins	169
25	Flonicamid	156
26	Proquinazid	156
27	Sulphur	152
28	Dicamba	127
29	Mecoprop-P	127
30	Cyprodinil	71
31	MCPA	61
32	Thiacloprid	15
33	Kresoxim-methyl	10
34	Esfenvalerate	6
35	Spirotetramat	5

**** Active ingredients not always sprayed as separate actives but also in formulated mixtures.***

Table 12 **The active ingredients* most extensively used on top fruit crops ranked by weight (kg) in Northern Ireland, 2020.**

No.	Active ingredient	Quantity applied (kg)
1	Captan	6,235
2	Mancozeb	3,065
3	Dodine	2,041
4	Potassium phosphonates	2,004
5	Glyphosate	1,060
6	Pyrimethanil	828
7	Dithianon	685
8	Copper oxychloride	557
9	Sulphur	364
10	2,4-D	312
11	Boscalid	297
12	Penthiopyrad	178
13	Pyraclostrobin	160
14	Fludioxonil	112
15	Prohexadione	102
16	Fluxapyroxad	93
17	Penconazole	54
18	MCPA	40
19	Difenoconazole	33
20	Methoxyfenozide	29
21	Tebuconazole	26
22	Myclobutanil	25
23	Cyprodinil	19
24	Mecoprop-P	19
25	Flonicamid	11
26	Chlorantraniliprole	10
27	Proquinazid	8
28	Deltamethrin	5
29	Dicamba	3
30	Cypermethrin	2
31	Thiacloprid	2
32	Kresoxim-methyl	1
33	Gibberellins	1
34	Spirotetramat	1
35	Esfenvalerate	<0.1

**** Active ingredients not always sprayed as separate actives but also in formulated mixtures.***

Table 13 **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment								
Pesticide group and active ingredient	**Canker**	**Mildew**	**Rot control**	**Scab**	**Scab and mildew**	**Storage aid**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Fungicides									
Boscalid/pyraclostrobin	40	.	393	1,020	39	254	1,746	843	447
Captan	26	.	.	5,562	65	.	5,653	1,113	6,197
Copper oxychloride	.	.	.	262	.	.	262	131	557
Cyprodinil/fludioxonil	14	.	.	56	.	.	71	71	32
Difenoconazole	.	.	.	561	.	.	561	345	29
Dithianon	126	.	.	992	52	.	1,170	569	353
Dithianon/potassium phosphonates	12	.	.	1,079	.	.	1,091	460	1,770
Dithianon/pyraclostrobin	.	.	.	19	.	.	19	10	8
Dodine	.	.	.	2,597	.	.	2,597	1,281	1,994
Fludioxonil	.	.	262	.	.	166	428	297	99
Fluxapyroxad	.	.	.	1,138	26	.	1,164	711	90
Kresoxim-methyl	.	.	.	10	.	.	10	10	1
Mancozeb	.	19	.	1,933	.	.	1,952	656	2,946
Myclobutanil	.	.	.	171	262	.	433	272	24
Penconazole	.	666	.	565	218	.	1,449	625	53
Penthiopyrad	14	.	.	1,171	13	.	1,198	634	173
Potassium phosphonates	.	.	.	469	26	.	495	230	556
Proquinazid	.	156	.	.	.	.	156	156	8
Pyraclostrobin	.	.	.	21	26	.	47	24	7
Pyrimethanil	.	.	.	2,328	.	.	2,328	927	821
Sulphur	.	.	.	152	.	.	152	76	364
Tebuconazole	.	.	.	229	.	.	229	130	26
Unknown fungicide	.	11	.	.	.	.	11	11	10
All fungicides	**232**	**852**	**655**	**20,336**	**726**	**420**	**23,222**	**.**	**16,566**

Table 13 (cont) **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment					
Pesticide group and active ingredient	**General weed control**	**Grass**	**Growth regulation**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Herbicides						
2,4-D/glyphosate	422	.	.	422	284	780
Dicamba/MCPA/mecoprop-p	4	.	.	4	4	6
Dicamba/mecoprop-p	119	.	.	119	60	21
Glyphosate	477	15	.	493	361	574
MCPA	50	.	.	50	34	34
All herbicides	**1,073**	**15**	**.**	**1,088**	**.**	**1,415**
Growth regulators						
Gibberellins	.	.	169	169	169	1
Prohexadione	.	.	764	764	457	102
All growth regulators	**.**	**.**	**933**	**933**	**.**	**103**

Table 13 (cont) **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment									
Pesticide group and active ingredient	**Aphids**	**Aphids and caterpillars**	**Blastobasis**	**Capsids**	**Codling moth**	**General insect control**	**Woolly aphid**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Insecticides and acaricides										
Chlorantraniliprole	.	.	15	.	20	258	.	294	283	10
Cypermethrin	131	.	.	.	.	61	.	192	174	2
Deltamethrin	124	45	23	13	.	260	282	748	585	5
Esfenvalerate	.	.	.	.	.	6	.	6	6	<0.05
Flonicamid	156	.	.	.	.	.	.	156	156	11
Methoxyfenozide	.	.	68	.	131	79	.	279	248	29
Spirotetramat	5	.	.	.	.	.	.	5	5	1
Thiacloprid	.	.	.	.	10	6	.	15	15	2
All insecticides and acaracides	**417**	**45**	**106**	**13**	**161**	**670**	**282**	**1,694**	**.**	**60**

Table 14 **'Other' top fruit: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment							
Pesticide type and formulation	**Scab**	**General Weed Control**	**Blastobasis**	**General Insect Control**	**Woolly aphid**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Fungicides								
Boscalid/pyraclostrobin	3	.	.	.	.	3	3	1
Captan	42	.	.	.	.	42	15	38
Difenoconazole	75	.	.	.	.	75	24	4
Dithianon	9	.	.	.	.	9	9	3
Dodine	49	.	.	.	.	49	24	47
Fluxapyroxad	29	.	.	.	.	29	24	2
Mancozeb	95	.	.	.	.	95	24	119
Myclobutanil	9	.	.	.	.	9	4	1
Penconazole	9	.	.	.	.	9	9	<0.5
Penthiopyrad	33	.	.	.	.	33	24	5
Pyrimethanil	18	.	.	.	.	18	9	7
All fungicides	**372**	**.**	**.**	**.**	**.**	**372**	**.**	**228**
Herbicides								
Dicamba/MCPA/mecoprop-p	.	3	.	.	.	3	2	<0.5
Glyphosate	.	17	.	.	.	17	11	17
MCPA	.	3	.	.	.	3	2	1
All herbicides	**.**	**23**	**.**	**.**	**.**	**23**	**.**	**19**
Insecticides								
Chlorantraniliprole	.	.	4	.	.	4	4	0.1
Deltamethrin	.	.	.	12	4	17	17	0.1
All insecticides	**.**	**.**	**4**	**12**	**4**	**21**	**.**	**0.2**

Table 15 **Estimated area treated (spha) and quantity of 'other' products applied (kg) to Bramley apple crops, 2020.**

Formulation	Bramley apples		Total	
	spha	kg	spha	kg
Boron	466	224	466	224
Boron/magnesium/phosphorus/zinc	156	343	156	343
Calcium	57	38	57	38
Calcium chloride	77	53	77	53
Calcium oxide	724	116	724	116
Calcium oxide/nitrogen	36	31	36	31
Calcium oxide/zinc	1,303	190	1,303	190
Calcium/nitrogen/phosphate	409	1,468	463	1,574
Copper/nitrogen/phosphorus	263	208	263	208
Iron	18	2	18	2
Magnesium sulphate	77	464	77	464
Manganese	13	4	13	4
Nitrogen	16	3	109	19
Nitrogen/phosphate/potassium oxide	117	128	117	128
Nitrogen/phosphorus	249	497	249	497
Nitrogen/phosphorus/potassium	13	2	13	2
NPK fertiliser	68	93	68	93
Phosphorus pentoxide/potassium oxide	4	7	34	58
Potassium nitrate	77	303	77	303
Seaweed extract	1,004	3,051	1,008	3,060
Unknown foliar feed	147	292	147	292
Zinc	93	65	93	65
Total	**5,389**	**7,581**	**5,570**	**7,763**

Table 16 **Total area (ha) of top fruit crops* grown in Northern Ireland, 1992-2020.**

	Survey year											
Crop Type	**1992**	**1996**	**2002**	**2006**	**2008***	**2010***	**2012***	**2014***	**2016***	**2018***	**2020***	**% change in area grown 2018/2020**
Bramley apples												
Bramley apples (fruiting)	1,574	1,511	1,265	1,341	1,463	1,491	1,503	1,510	1,488	1,457	1,336	-8.3%
Bramley apples (non-fruiting)	158	189	197	74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Bramley apples	**1,732**	**1,701**	**1,462**	**1,415**	**1,463**	**1,491**	**1,503**	**1,510**	**1,488**	**1,457**	**1,336**	**-8.3%**
Other top fruit crops												
Other top fruit crops (fruiting)	57	13	20	21	19	25	3	9	38	41	26	-36.2%
Other top fruit crops (non-fruiting)	5	0.4	4	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All other top fruit crops	**62**	**13**	**24**	**35**	**19**	**25**	**3**	**9**	**38**	**41**	**26**	**-36.2%**
Total crops	**1,794**	**1,714**	**1,486**	**1,450**	**1,482**	**1,516**	**1,506**	**1,519**	**1,526**	**1,498**	**1,362**	**-9.1%**

*** Note: From 2008, fruiting and non-fruiting crops were recorded together.**

Table 17a **Total area treated (A (spha)) and quantity of pesticides* applied (B (kg)) to top fruit crops in Northern Ireland, 1992-2010.**

	Survey year											
	1992		**1996**		**2002**		**2006**		**2008**		**2010**	
Pesticide Type	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Fungicides	20,272	13,549	21,620	20,672	23,473	26,756	24,836	20,132	27,200	23,554	28,593	26,796
Herbicides	761	865	1,190	1,652	1,000	881	899	875	965	1,206	1,314	1,805
Growth regulators	134	69	713	137	610	107	990	126	2,066	219	2,313	226
Mixed activity a.i.'s	11	73	17	14	.	.	.	.	.	.	.	.
Insecticides (by classification)												
Acaricides	112	31	751	157	201	24	301	24	645	93	.	.
Biopesticides	.	.	.	.	.	.	13	2	.	.	.	.
Carbamates	33	56	32	7	88	10	104	17	152	33	139	33
Neonicotinoids	.	.	.	.	.	.	.	.	.	.	.	.
Organochlorines	153	101	30	19	.	.	.	.	.	.	.	.
Organophosphates	2,357	1,733	2,239	1,870	1,373	996	1,129	811	1,305	1,016	976	702
Pyrethroids	586	13	464	16	481	18	595	18	496	23	983	27
Unknown insecticides**	.	.	.	.	.	.	.	.	.	.	.	.
Other insecticides	524	465	182	60	115	139	47	6	.	.	445	81
All Insecticides	**3,765**	**2,399**	**3,698**	**2,129**	**2,258**	**1,186**	**2,189**	**878**	**2,598**	**1,165**	**2,543**	**843**
All pesticides	**24,943**	**16,955**	**27,238**	**24,604**	**27,341**	**28,930**	**28,914**	**22,011**	**32,831**	**26,125**	**34,763**	**29,669**

* Does not include 'other' pesticide types

** No weight available for unknown insecticides

Table 17b **Comparison of area treated (spha) and quantity of pesticides* applied (kg) to top fruit crops in Northern Ireland, 2012-2020.**

	Survey year									
	2012		**2014**		**2016**		**2018**		**2020**	
Pesticide Type	**A**	**B**	**A**	**B**	A	B	A	B	A	B
Fungicides	32,505	32,604	28,597	23,748	31,386	23,438	25,535	20,911	23,594	16,794
Herbicides	1,020	1,142	1,953	1,651	1,895	1,340	1,286	1,354	1,112	1,434
Growth regulators	2,151	195	1,423	125	1,959	104	1,285	93	933	103
Mixed activity a.i.'s	.	.	.	.	.	.	.	.		
Insecticides (by classification)										
Acaricides	96	35	.	.	2	<1	.	.	.	.
Biopesticides	.	.	.	.	.	.	.	.	.	.
Carbamates	86	23	248	31	67	14	.	.	.	.
Neonicotinoids	.	.	.	.	.	.	8	1	15	2
Organochlorines	.	.	.	.	.	.	.	.	.	.
Organophosphates	868	684	684	533	177	87	.	.	.	.
Pyrethroids	980	26	460	10	1,789	41	1,021	31	962	8
Unknown insecticides**	.	.	.	.	.	.	10	**	.	.
Other insecticides	126	14	411	61	725	64	1,358	113	738	50
All Insecticides	**2,156**	**782**	**1,811**	**637**	**2,761**	**206**	**2,397**	**146**	**1,716**	**60**
All pesticides	**37,832**	**34,723**	**33,784**	**26,161**	**38,001**	**25,088**	**30,503**	**22,504**	**27,355**	**18,391**

* Does not include 'other' pesticide types

** No weight available for unknown insecticides

Table 18 **Application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2020.**

	Survey year										
Active Ingredient	**1992**	**1996**	**2002**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**
2,4-D	.	.	.	.	.	.	.	.	.	0.9	1.1
Boscalid	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.4
Captan	1.9	1.9	1.3	1.4	1.7	3.8	4.3	4.2	4.3	4.2	5.5
Chlorantraniliprole	.	.	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos	0.3	0.3	0.4	0.6	0.7	0.5	0.5	0.3	0.5	.	.
Clofentezine	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	.	.
Clopyralid	.	.	.	.	.	.	.	<0.7	.	.	.
Copper oxychloride	0.7	0.4	0.7	0.4	0.7	0.5	0.1	0.2	2.5	2.7	4.2
Copper sulphate	0.3	0.1	0.2	.	.	<0.1	0.1	.	.	.	.
Cypermethrin	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyprodinil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.7	0.3	<0.1
Deltamethrin	<0.1	.	<0.1	.	.	<0.1	<0.1	<0.8	<0.1	<0.1	<0.01
Dicamba	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8	0.1	<0.01
Difenoconazole	.	.	<0.1	.	<0.1	<0.1	<0.1	<0.1	<0.01	0.2	0.1
Dimethoate	.	.	.	.	.	.	.	<0.3	.	.	.
Dithianon	1.4	2.4	3.3	2.5	4.0	3.3	2.6	1.4	1.7	1.3	0.7
Dodine	0.1	0.5	0.3	0.7	0.6	0.7	1.0	1.5	1.4	1.4	1.6
Esfenvalerate	.	.	.	.	.	.	.	.	.	<0.1	<0.01
Fenbuconazole	.	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	.
Flonicamid	.	.	.	.	.	.	.	.	.	0.1	0.1
Florasulam	.	.	.	.	.	.	.	.	.	<0.01	.
Fludioxonil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.1	0.3	0.3
Flutriafol	.	.	.	.	.	.	.	<0.5	.	.	.
Fluxapyroxad	.	.	.	.	.	.	.	.	.	0.2	0.1
Gibberellins	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.6	.	<0.01	<0.01
Glufosinate-ammonium	<0.1	<0.1	<0.1	.	<0.1	<0.1	<0.1	.	.	.	.
Glyphosate	0.1	0.4	0.3	0.3	0.6	0.8	0.5	0.6	1.3	1.6	1.6
Halauxifen-methyl	.	.	.	.	.	.	.	.	.	<0.01	.
Kresoxim-methyl	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	.	<0.01	0.1
Lime	.	.	.	.	.	.	0.1	.	.	.	.
Lime sulphur	0.2	.	.	.	.	<0.1	0.1	.	3.7	.	.

Table 18 (cont) **Application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2020.**

	Survey year										
Active Ingredient	**1992**	**1996**	**2002**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**
Mancozeb	2.2	5.9	11.4	7.2	6.7	6.8	7.8	6.0	6.9	5.0	4.5
MCPA	<0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.4	1.2	1.1	1.0
Mecoprop-P	.	.	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.8	0.5	0.3
Methoxyfenozide	.	.	.	.	.	.	<0.1	<0.1	0.1	0.1	0.1
Myclobutanil	0.3	0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.2	0.1
Paclobutrazol	<0.1	0.1	.	0.1	<0.1	0.1	0.1	<0.1	0.1	.	.
Paraffin oil	.	.	.	.	.	.	.	<0.1	.	.	.
Penconazole	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1
Penthiopyrad	.	.	.	.	.	.	.	.	.	0.3	0.3
Pirimicarb	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	.	.
Potassium phosphonates	.	.	.	.	.	.	.	.	.	3.6	3.8
Prohexadione	.	.	.	.	.	.	.	.	.	0.1	0.2
Prohexadione-calcium	.	.	.	<0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	.
Proquinazid	.	.	.	.	.	.	.	.	.	0.2	<0.05
Pyraclostrobin	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.2
Pyrimethanil	.	<0.1	0.3	0.6	1.1	0.9	1.1	0.7	0.7	0.8	0.9
Spirodiclofen	.	.	.	.	.	.	<0.1	<0.1	.	.	.
Spirotetramat	.	.	.	.	.	.	.	.	.	.	0.1
Sulphur	.	<0.1	0.2	0.1	0.7	0.9	4.2	1.1	3.7	3.9	4.8
Tebuconazole	.	.	.	.	.	.	<0.1	.	0.4	0.3	0.2
Tebufenpyrad	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.4	<0.1	0.1	.
Thiacloprid	.	.	.	.	.	.	.	.	.	0.1	0.1
Triclopyr	.	.	.	.	.	.	.	<0.2	.	.	.

Table 19 **Estimated quantities (tonnes) of stored apples receiving treatment, the total amount of active ingredients applied (kg) and reason for treatment in Northern Ireland, 2020.**

Pesticide formulation	Quantity treated	Quantity applied	Reason for use
1-methylcyclopropene	13,390	*N/A	Storage aid
All treatments	**13,390**	***N/A**	**Storage aid**

*Due to the application method it was impossible to calculate the weight of active ingredient applied

Table 20a **Estimated quantities (tonnes) of Bramley apples stored and the total weight of active ingredients applied (kg) in Northern Ireland, 1992-2010.**

	Survey year											
	1992		1996		2002		2006		2008		2010	
Pesticide formulation	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**
Antioxidants												
Diphenylamine	2,154	71	10,496	611	7,778	195	13,216	307	16,630	435	15,966	433
Ethoxyquin	8,350	378	1,381	50	750	15	.	.	.	.	.	.
All antioxidants	**10,504**	**449**	**11,877**	**661**	**8,528**	**210**	**13,216**	**307**	**16,630**	**435**	**15,966**	**433**
Fungicides												
Benomyl	4,166	124	.	.	385	4	332	2	.	.	.	.
Carbendazim	1,789	39	6,372	87	5,384	44	830	4	.	.	.	.
Carbendazim/metalaxyl	4,299	115	3,901	90	.	.	.	.	.	.	.	.
Captan	.	.	.	.	117	64	477	195	.	.	.	.
Cyprodinil/fludioxonil	.	.	.	.	.	.	.	.	214	1	256	1
Thiophanate-methyl	436	5	1,146	40	.	.	129	1	.	.	.	.
Metalaxyl-M	.	.	.	.	.	.	4,207	5	.	.	.	.
All fungicides	**10,690**	**283**	**11,419**	**217**	**5,886**	**112**	**5,975**	**207**	**214**	**1**	**256**	**1**
Other products												
1-methylcyclopropene	.	.	.	.	.	.	.	.	.	.	345	1
All other products	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**345**	**1**
All treatments	**21,194**	**732**	**23,296**	**878**	**14,414**	**322**	**19,191**	**514**	**16,844**	**436**	**16,567**	**435**
Stored without treatment	***2,322***	***.***	***384***	***.***	***17***	***.***	***408***	***.***	***689***	***.***	***670***	***.***
Total stored	**23,516**	**.**	**23,680**	**.**	**14,431**	**.**	**19,599**	**.**	**17,533**	**.**	**17,237**	**.**

Table 20b **Estimated quantities (tonnes) of Bramley apples stored and the total weight of active ingredients applied (kg) in Northern Ireland, 2012-2020.**

	Survey year									
	2012		2014		2016		2018		2020	
Pesticide formulation	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**
Antioxidants										
Diphenylamine	.	.	.	.	.	.	.	.	.	.
Ethoxyquin	.	.	.	.	.	.	.	.	.	.
All antioxidants	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**
Fungicides										
Benomyl	.	.	.	.	.	.	.	.	.	.
Carbendazim	.	.	.	.	.	.	.	.	.	.
Carbendazim/metalaxyl	.	.	.	.	.	.	.	.	.	.
Captan	.	.	.	.	.	.	.	.	.	.
Cyprodinil/fludioxonil	490	3	.	.	629	6	.	.	.	.
Thiophanate-methyl	.	.	.	.	.	.	.	.	.	.
Metalaxyl-M	.	.	.	.	.	.	.	.	.	.
All fungicides	**490**	**3**	**.**	**.**	**629**	**6**	**.**	**.**	**.**	**.**
Other products										
1-methylcyclopropene	8,502	<1	9,706	N/A	20,625	N/A	12,395	N/A	13,390	N/A
All other products	**8,502**	**<1**	**9,706**	**N/A**	**20,265**	**N/A**	**12,395**	**N/A**	**13,390**	**N/A**
All treatments	**8,992**	**3**	**9,706**	**N/A**	**21,254**	**6**	**12,395**	**.**	**13,390**	**N/A**
Stored without treatment	***1,167***	***.***	***1,366***	***N/A***	***3,131***	***N/A***	***2,079***	***N/A***	***2,633***	***N/A***
Total stored	**10,159**	**.**	**11,072**	**N/A**	**24,385**	**.**	**14,474**	**.**	**16,023**	**.**

Table 21 **Total grown area (ha), total quantity harvested (tonnes) and total yield (tonnes/ha) of Bramley apple crops by age of orchard, in Northern Ireland, 2020.**

Age of orchard (years)	Total grown area (ha)	Total quantity harvested (tonnes)	Yield (tonnes/ha)
Bramley apples			
< 5	96	2,048	21.2
5 to 9	65	1,905	29.3
10 to 14	117	3,709	31.6
15 to 24	262	7,589	29.0
25 to 34	191	8,910	46.7
> 35	604	14,423	23.9
Total Bramley apples	**1,336**	**38,586**	**181.6**

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
118	Top Fruit Crops 1992	1-855 27 194 X
124	Grassland & Fodder crops 1993	1-855 27 221 0
131	Forestry 1993	1-855 27 282 2
132	Arable Crops 1994	1-855 27 314 4
139	Vegetable Crops 1995	1-855 27 346 2
140	Mushroom Crops 1995	1-855 27 347 0
146	Arable Crops 1996	1-855 27 469 8
147	Top fruit 1996	1-855 27 470 1
156	Grassland & Fodder Crops 1997	1-855 27 506 6
157	Sheep Treatments 1997	1-855 27 425 6
167	Soft Fruit 1998	1-855 27 540 6
168	Arable Crops 1998	1-855 27 536 8
169	Vegetable Crops 1999	1-855 27 561 9
170	Mushroom Crops 1999	1-855 27 549 X
177	Arable Crops 2000	1-855 27 670 4
178	Top Fruit Crops 2002	1-855 27 618 6
194	Arable Crops 2002	1-855 27 674 7
198	Grassland & Fodder Crops 2003	1-855 27 797 2
199	Hardy Nursery Stock Crops 2003	1-855 27 789 1
201	Protected Ornamental Crops 2003	1-855 27 739 5
206	Arable Crops 2004	1-855 27 833 2
207	Vegetable crops 2004	1-855 27 869 3
208	Grassland & Fodder Crops 2005	1-855 27 998 8
209	Sheep Treatments 2005	1-855 27 999 5
216	Arable Crops 2006	1-848 07 035 6
217	Top Fruit Crops 2006	1-848 07 019 6
218	Soft Fruit Crops 2006	1-848 07 036 3

Northern Ireland Pesticide Usage Survey Published Reports Appendix 1 (contd.)

Report No.	Report title	ISBN
222	Vegetable Crops 2007	1-848 07 062 2
223	Mushroom Crops 2007	1 848 07 061 5
230	Arable Crops 2008	1 848 07 135 3
231	Top Fruit Crops 2008	1-848 07 134 6
238	Grassland & Fodder Crops 2009	1-848 07 186 5
239	Hardy Nursery Stock Crops 2009	1-848 07 187 2
240	Soft Fruit Crops 2010	1-848 07 251 0
242	Arable Crops 2010	1-848 07 252 7
245	Mushroom Crops 2011	1-848 07 308 1
246	Vegetable Crops 2011	1-848 07 309 8
247	Arable Crops 2012	1-848 07 404 3
248	Soft Fruit Crops 2012	1-848 07 402 6
249	Top Fruit Crops 2012	1-848 07 403 3
258	Grassland & Fodder Crops 2013	1-848 07 485 9
259	Vegetable Crops 2013	1-848 07 486 6
260	Arable Crops 2014	1-84807-552-8
261	Top Fruit Crops 2014	1-84807-553-5
262	Soft Fruit Crops 2014	1-84807-571-9
267	Edible Protected Crops 2015	1-84807-684-6
268	Vegetable Crops 2015	1-84807-685-3
275	Arable crops 2016	1-84807-808-6
276	Soft Fruit Crops 2016	1-84807-809-3
277	Top Fruit Crops 2016	1-84807-810-9
280	Edible Protected Crops 2017	1-84807-918-2
281	Vegetable Crops 2017	1-84807-917-5
282	Grassland & Fodder Crops 2017	1-84807-916-8
288	Arable Crops 2018	1-83887-064-5
289	Soft Fruit Crops 2018	1-83887-065-2
290	Top Fruit Crops 2018	1-83887-066-9
293	Vegetable Crops 2019	1-908471-15-4
294	Edible Protected Crops 2019	1-908471-16-1

ISBN 978-1-908471-20-8

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